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The Impact of Television Program Diet on Children's Achievement

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THE IMPACT OF TELEVISION PROGRAM DIET ON CHILDREN'S ACHIEVEMENT

A Dissertation Presented

By

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ABSTRACT

THE IMPACT OF TELEVISION PROGRAM DIET ON CHILDREN'S ACHIEVEMENT

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While studies have examined the link between television exposure and later achievement, few have examined the developmental processes over more than two time points. Some studies conclude that the type of content children view is important in predicting children's development (Anderson, Huston, Schmidt, Linebarger, & Wright, 2001; Wright Huston, Murphy, St. Peters, Pinon, Scantlin, & Kotler, 2001). However, other studies suggest that the total amount of television exposure is important when modeling the affects on achievement (Razel, 2001; Shin, 2004).

The research described here compares results from these approaches to modeling children's achievement. In this study, three waves of data from the Panel Study of Income Dynamics's (PSID) Child Development Supplement (CDS) were used to examine patterns of children's early TV exposure and its influence on middle childhood and adolescence. Specifically, the influence of television viewing during 1997 was analyzed in relation to 2002 behaviors such as independent reading, prosocial behavior, and internalizing/externalizing behavior problems as mediators of academic self-esteem

and achievement in 2007.

Path analyses examined the pathways of influence depending on whether a dosage (hours of exposure) or diet (proportion of content to total TV time) variable was used. Results revealed that, in a dosage model, violent hours of early TV exposure (1997) were associated with intermediate (2002) decreases in independent reading and increases in externalizing behavior problems, but these did not predict later (2007) achievement. Early educational TV amount of exposure was unassociated with intermediate behaviors and was only related to later math achievement. In the context of a diet model, total time spent viewing television was related to intermediate decreases in independent reading and prosocial behavior and increases in internalizing and externalizing behavior problems. Violent TV diet (proportion of TV viewing of violent content), contrastingly, was no longer related to any outcome. Educational TV diet, on the other hand, was positively associated with reading and math achievement in 2007. When the effects of early educational TV viewing were modeled on achievement over time, results suggest that the positive associations between educational TV diet and achievement in reading and math endure over time in significance and magnitude.

These results suggest two conclusions: educational television viewing (particularly proportion of total TV viewing that is educational) is positively associated with reading and math achievement 10 years later even while controlling for socioeconomic status. Second, the methodological issue of which type of viewing variable to use, dosage or diet, is one that may have serious implications for the findings of research on media impact.

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CHAPTER I

CHILDREN AND EARLY TELEVISION VIEWING

Introduction

Research supports a connection between viewing educational television programs and children's learning of academic and prosocial skills (see Lavigne & Anderson, 2012 for a review). Several studies have examined the long-term effects of educational television on achievement (e.g., Anderson, Huston, Schmidt, Linebarger, & Wright, 2001; Wright Huston, Murphy, St. Peters, Pinon, Scantlin, & Kotler, 2001). However, the reach of such studies is limited due to factors such as use of convenience samples, lack of adequate control variables, or paucity of television viewing data.

This dissertation improves and extends the existing research by examining the impact of children's early educational TV exposure on later adolescent achievement. The dissertation used data from a national longitudinal sample of families. Using the Child Development Supplement (CDS) data from the Panel Study of Income Dynamics (PSID), children's early television diet was assessed using activity diary data reported by their parents. Models examined the behavioral and knowledge pathways through which early TV viewing is associated with later achievement. These analyses also examined whether viewing associations endure over time or had differing levels of importance across development.

A review of the literature considers influences on children's academic achievement and provides estimates of children's exposure to television. This work contextualizes questions of TV exposure timing and its effects on children's later achievement. Existing research on the effects of educational television is

considered with an emphasis on investigations of early viewing and the subsequent impact on achievement.

Children's Academic Achievement: Influential Factors

A number of factors have strong empirical support in predicting children's academic outcomes. What follows is a brief review of four factors that have exhibited robust relationships with academic achievement over time: time spent reading, social behavior, academic self-esteem, and the role of television. While various other aspects of the educational ecology have been examined, the aspects discussed below have been found to show interesting relationships with both children's television viewing and achievement.

Time Spent Reading

It is no surprise that a child's time spent reading predicts later academic achievement. In a study of 920 Irish fifth-graders, Graeney (1980) found that children's reading time outside of school was positively associated with reading achievement. Anderson, Wilson, and Fielding (1988) found that the amount of time children spend independently reading is positively associated with reading achievement; the authors also found large variability in the amount of time children spent reading in the home, with a mean of 10.1 hours per week and a standard deviation of 16.8. Anderson and colleagues concluded that, the more independent reading a child does, the higher the gains students are likely to make in reading between second and fifth grade. It is suggested that time spent reading independently increases children's vocabulary (Nagy, 1988), builds fluency

(LaBerge & Samuels, 1974), and increases general knowledge (Anderson & Pearson, 1984).

More recent research continues to support these associations. In a longitudinal assessment of recreational reading and its association with achievement, Block and Mangeieri (2002) found that leisure-time reading is positively associated with higher vocabulary scores, higher achievement, and more advanced writing ability. Guthrie (2004) found that reading time was most strongly associated with comprehension performance than all other demographic variables such as family income, SES, or ethnicity.

Social Behavior

Children's behavior has a profound influence on their academic achievement. Studies show that it is important for children to arrive at school with foundations of early socio-emotional skills (e.g., self regulation) (Lin, Lawrence, & Gorrell, 2003). Other work suggests that early elementary school is an important time period for young children to navigate the social expectations for behavior in school (Kellham & Rebok, 1992). Kim-Cohen and colleagues (2005) found that approximately 65 percent of children who entered school with high levels of aggression showed both higher levels of behavior problems and difficulty with academics two years later. Many other longitudinal studies examining the influence of children's behavior on academic performance are consistent in their findings that behavior problems early in life continue to be associated with poorer academic outcomes into adolescence (Darney, Reinke, Herman, Stormont, & Ialongo, 2013; Petras, Chilcoat, Leaf, Ialongo, & Kelham, 2004; Tremblay et al., 1992). When comparing the strength of effects, Casillas and colleagues (2012) found that

behavioral factors account for similar amounts of variance in high school GPA as compared to that accounted for by prior academic grades.

Academic Self Esteem

Aspects of a child's personality can also account for variation in academic achievement; of particular interest in the current study is academic self-esteem. Self-esteem is not purely about actual success, but the child's ability to think positively about his/her own education. This type of positive thinking can be predictive of academic achievement beyond the variation accounted for by cognitive ability. In a study conducted by Leeson, Ciarrochi, and Heaven (2008), high school students were assessed over the course of three years for cognitive ability, achievement, and positive thinking variables: self-esteem, hope, and attributional style. Results of the authors' structural equation models suggest that the latent factor of positive thinking played a role in predicting grades above and beyond the effects attributable to cognitive ability. This finding builds on Bandura's (1977) theory of self-efficacy, such that high levels of confidence can play a significant role in the way that individuals approach the act of learning and/or the achievement of goals.

The Role of Television

A great deal of attention has focused on the formative years of education to set solid foundations for later achievement. Individuals better prepared for school show more positive outcomes later in life than less prepared peers (Duncan et al., 2007; Shonkoff & Phillips, 2000). The demand for a high-quality, universal system for pre-Kindergarten education, however, far outweighs the supply of qualified teachers in the current system as well as a sufficiency of government funds to launch large-scale initiatives of preschool

improvement (Pianta, Cox, & Snow, 2007). In their work examining the impact of high-quality interventions on children's vocabulary development, Hart and Risley (1995) suggest that, while many intense interventions have the ability to stimulate positive change, most are not financially plausible for implementation nationwide. Therefore, it is important, for practical reasons, to understand how achievement can be shaped through more informal, cost-effective methods to bridge the gaps between families of means and those without. One such possibility is through the creation and distribution of research-based educational television.

A great deal of research has focused on the relationship between television viewing and achievement (see Comstock, 2013 for a review). As a result, several tracks of robust research have examined this topic focusing on two sets of hypotheses: the relationship between total time spent with television and achievement as well as the association between specific forms of television content (e.g., violent, education), behavior, and subsequent achievement. While many studies have found an inverse relationship between total time spent viewing television and achievement (e.g., Gaddy, 1986, Shin, 2004), it has also been hypothesized that a great deal hinges on the quality of children's television exposure in predicting later outcomes (Comstock & Scharrer, 1999).

Modern Estimates and Contexts of Children's Early TV Exposure

It is widely recognized that television has the ability to influence children's development and behavior (see Calvert & Wilson, 2008 for a review). Given that fact, a crucial part of contemporary research is to understand the variability of children's home media diets (e.g., how much they watch, what programs they watch, what other kinds of media they use) to contextualize what we know about family television use and its

potential to influence children's development. Media diet is comprised of two assessments: the total quantity of hours viewed as well as the quality of viewed content. What follows is a review of the literature on typical patterns of exposure for American children as well as how each component of the media diet may contribute to children's development.

Hours of Exposure

Despite the growing number of alternative screen options in the home, data collected by the Kaiser Family Foundation (Rideout et al., 2003, Rideout & Hamel, 2006) and Common Sense Media (2011) suggest that television continues to be the primary source for young children's media consumption. Recent reports suggest that two-thirds of children ages 0 to 8 watch TV at least once per day (Common Sense Media, 2011). Within this age range, consumption can vary substantially, as only 37 percent of children under the age of one watch television compared to the 73 percent of 2 to 4 year olds and 72 percent of 5 to 8 year olds watch at least once per day (Common Sense Media, 2011). This same report suggests that the average age for children's first TV viewing is at 9 months of age.

Between the ages of 0 and 8, children spend an average of 1 hour and 44 minutes with television on a typical day, accounting for approximately 74 percent of total screen time each day (Common Sense Media, 2011). Compared to daily estimates for reading (29 minutes), listening to music (29 minutes) and video games (25 minutes), it is obvious that television still plays a major role in defining children's leisure time. In addition to levels of daily exposure, it is estimated that 42 percent of children under the age of 8 have access to a television in their bedroom. Broken down within this age range, 30 percent of

children under 1, 44 percent of 2 to 4 year olds, and 47 percent of 5 to 8 year olds have a TV in their bedroom (Common Sense Media, 2011).

Studies examining the trends of individual TV use over time suggest that heavy TV viewers in childhood are more likely to grow up to be heavy television viewers as adults (Rideout, Vandewater, & Wartella, 2003). Through a comparison of family surveys from 2005 and 2011, one can examine trends in family television consumption (Common Sense Media, 2011; Kaiser Family Foundation, 2005). For children under two years of age, the average amount of TV time (including DVDs) has increased slightly, from 24 minutes per day in 2005 to 42 minutes per day in 2011. The percentage of parents who read to their child on a daily basis decreased from 58 in 2005 to 47 in 2011. Interestingly, the percentage of children under 1 with TVs in their bedroom has risen from 19 percent to 29 percent since the last survey in 2005 (Kaiser, 2005; Common Sense Media, 2011). While there are slight methodological alterations[1] on how the survey was conducted, results suggest that families, while aware of APA recommendations to limit screen time, still act as if a television in the bedroom may not be a harmful addition. These trends suggest that, as media become more accessible to families, children have greater independence in deciding what to watch on television. Therefore, it is important that we understand how differences in media diet may influence children's developmental outcomes over time.

Quality of Exposure

Common Sense Media (2011) also measured how often children viewed

[1] Common Sense Media provided a comparison between their 2011 study and the Kaiser Family Foundation study from 2005. Kaiser did their survey over the phone and CSM did their survey online. Also, Kaiser only looked at children 6-23 months, so for CSM's comparisons to their numbers, they took a subset of their children under two (leaving out the birth – 5 months children).

educational media. Findings suggest that children from low-income homes engage with educational television more frequently than children from families of higher means. The study reports that 26 percent of low-income families report viewing educational television shows "often" as compared to 17 percent of higher-income families. In contrast, only 2 percent of low-income families report frequent use of educational games on mobile devices as compared to 11 percent of higher income families. These figures suggest that educational media play a regular part in children's lives, with television playing a more frequent role in homes of lower socioeconomic status.

The patterns of educational television consumption might be a very different experience for high-income versus low-income children. For low-income children, educational television delivered via broadcast may provide access to stimulating educational content that may otherwise have been unavailable. For example, the Early Window Project found that, for low income families, parent primary language and assessments of the home environment (captured through the HOME inventory short form) were positively related to the amount of informative programming viewed by children (Wright et al., 2001).

Unlike other kinds of health-related diets such as a nutrition diet or physical fitness diet, no formal guidelines exist for a well-balanced media diet. Due in part to the complexity in defining what constitutes high-quality or beneficial television, it is difficult for public policymakers to determine television's value over other types of learning activities and make recommendations about ideal patterns of exposure.

Demographic Predictors of TV Exposure

Very few empirical studies have made the demographic predictors of children's

television viewing a primary objective. Lee, Bartolic, and Vandewater (2009) conducted specific analyses to investigate the important predictors of children's media use. Their results suggest that the quality of family neighborhoods, parental limits on child TV viewing, and levels of family conflict are all significant predictors of children's media use, both in cross sectional and longitudinal data. Surprisingly, family income was not a significant predictor of children's media use. Parent education did not predict overall TV viewing but positively predicted the amount of educational media viewing. In a separate study, Vandewater and colleagues (2005) found that family conflict was not related to total TV viewing time or nonviolent TV usage in PSID families. However, they did find a positive relationship between family conflict and violent TV usage in children ages 6-12 years of age. In follow up analyses, the researchers tested potential hypotheses of TV viewing as a means for escaping conflict within the family irrespective of content, decreasing violent content as a reaction to family conflict, or a more contextual hypothesis that suggests that children in high conflict families stimulate higher levels of interest in violent content. After testing for these three types of effects, their models supported a family context hypothesis suggesting that the tensions present in the family may potentially motivate children's interest in violent media.

While illuminating in their own way, estimates of time spent with television do not speak fully to the relationship between TV viewing and children's subsequent outcomes. Two children who spent the same amount of time viewing television have very different stories. As seen in literature presented in the sections that follow, a child who watches 4 hours of educational media per day will be expected to have different outcomes than a child who watches 4 hours of adult directed programming per day.

Using the concept of media diet rather than just amount of media use paves the way for more complex investigations into children's media use and how variations in amount and quality affect different aspects of development. Contrasting the effects of educational TV versus total time spent with television (or violent TV time versus total time spent with TV) allows for an investigation as to whether quantity of exposure is the most important element or if quality of television exposure, or TV diet, is predictive in its own ways.

Overall, a great deal of effort has attempted to accurately measure children's television viewing, particularly during the early years of life. Yet, less effort has been focused on understanding the relationship between early viewing and its effects on later developmental outcomes, especially academic achievement.

The Effects of Television on Young Children

Historically, two camps have emerged with theories on how television affects children's scholastic achievement: those that believe in medium-based theories of influence, suggesting that it is the medium of television itself that influences outcomes, versus those who take a more content-focused approach, who suggest that it is the actual program content that is the primary influence (Anderson et al., 2001).

Medium-focused Theories

From the medium-based perspective, television works negatively against scholarly pursuits by taking time away from other more cognitively stimulating activities such as reading, studying, or doing homework; this is referred to as a displacement effect. While this notion remains popular in the argument against television, several studies suggest that television does not displace active reading time in children as young as six and as old as 10th and 11th graders (Gaddy, 1986; Gortmaker, Salter, Walker & Deitz,

1990; Ritchie, Price, & Roberts, 1987). In fact, television has often been claimed to displace time spent with "functionally similar" media such as listening to music, going to movies, and reading for entertainment purposes (e.g., comic books) (Neuman, 1991; Schramm, Lyle, & Parker, 1961).

Other research has found support for the displacement hypothesis. In the California Assessment Program (CAP) from 1980, researchers found a displacement effect of television on reading, math, and written expression scores in over 500,000 students in fifth and twelfth grade (California Assessment Program, 1980; as cited by Comstock, 2013). In replication of the CAP findings, Neumann (1988) demonstrated similar reductions in academic performance across seven other states. A more recent study conducted by Shin (2004) sought to test the displacement hypothesis (among other theoretical relationships) using data from the Panel Study of Income Dynamics. By using television viewing data to predict achievement along with indirect effects through time spent on homework, recreational reading and impulsive behaviors, Shin found support for the displacement hypothesis such that the more total time spent viewing TV (regardless of content), the less time spent on homework, less time spend reading for fun, both of which predicted achievement. In another study, Huston, Wright, Marquis, and Green (1999) found that television displaced activities like reading and social interactions, but only for viewing time with programs that were considered to be non-educational.

Others who cite the negative effects of television as a medium suggest that young viewers are deprived of activities that require mental effort, creating children that are primed for cognitive passivity. Proponents of this perspective state that, with its excited pace, television creates children that have been acclimated to the notion that school is less

interesting than television (Koolstra & Van der Voort, 1996). With the heightened concern as to whether television viewing is associated with the development of attention-related learning disabilities, this question has received a great deal of attention with findings that both support (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Miller et al., 2007) and reject a significant relationship (Obel et al., 2004; Stevens & Muslow, 2006). Yet, the current body of work has yet to find a causal link between television exposure and the development of ADHD or other learning disabilities. Many investigations of this kind are correlational by nature, and thus, one cannot assume causality from significant findings. Just as it is possible that televisions viewing 'causes' attention problems, it is also equally as likely that children with attention problems are drawn to television, thus engaging in more viewing time. A significant criticism of the work examining the relationship between television and achievement is that the directionality of effect has yet to be determined.

Children's independent reading time has often been specifically cited as negatively influenced by television's displacement effects. In a study examining the longitudinal association between television viewing and reading, Koolstra and van der Voort (1996) found that second through fourth grade children with displaced reading showed reduced reading ability and lower interest in reading years later. However, other evidence from Ritchie, Price and Roberts (1987) suggests that television viewing was not predictive of differences in reading ability. While these results are mixed, it is possible that large amounts of television viewing during the early years might influence children's trajectories for reading achievement later in life.

One question that has been thoroughly investigated is how this displacement relationship is moderated by socioeconomic status. While the CAP study found an association between high levels of viewing and lower achievement, Comstock (2013) notes that the relationship between SES and achievement is much stronger than the relationship with television viewing and achievement. The results from the CAP suggest that, as SES increases, the slope between television viewing and achievement becomes steeper. These results suggest that when children forego other available, potentially more valuable opportunities, the negative effects on achievement may be intensified. Additional work by Gaddy (1986) suggests that the association between television viewing and achievement disappears with the inclusion of various control variables such as prior grades and richness of educational resources at home. While many researchers have tried, it is difficult to disentangle the effects of television with other environmental factors.

Content-focused Theories

Alternatively, there are other researchers who take a content-focused approach to television's effects on development. From this perspective, children's developmental outcomes are largely related to the content viewed during TV time. Children receive a variety of messages through television that can affect their subsequent thinking and behavior in various ways. How behavior and cognitive processes are affected depends heavily on the messages embedded within the content. Bandura (1994) suggests that children encode messages from media that can be retrieved at a later time for imitation. Similarly, information-processing theorists suggest that television content may alter children's cognitive scripts (e.g., importance of academics, appropriateness of aggressive

behavior) (Huesmann, 1986). From a slightly different approach, cultivation theory (i.e. Gerbner et al., 1994) suggests that television viewers are not influenced by any one televised message; instead, TV imposes its influence cumulatively. As messages become incorporated into an individual's understanding, his or her cognition will be affected accordingly.

If one assumes that different types of television content will showcase a unique set of effects on children's academic achievement, it is important to understand how entertainment versus educational programs differ in their typical effects. Generally, it is found that the more television viewing, the lower is children's academic achievement; but as pointed out by Kirkorian and Anderson (2008), the effect sizes are small. In a meta-analysis that investigates this relationship, Williams and colleagues (1982) found that, across 23 studies, the average correlation between TV viewing and academic achievement was -.05. In addition, it was reported that a curvilinear relationship is the best description of the association between TV viewing and academic achievement. Light viewing (less than 10 hours per week) was positively associated with academic achievement whereas higher levels were associated with poorer academic performance. In another meta-analysis, Razel (2001) found additional support for a curvilinear relationship, also noting that the "optimal amount" of television viewing for a child changes with age. These results suggest that 3 hours of television per day is ideal with 4-year-olds, whereas for 9 and 15 year olds, the numbers decrease to 2 and 1 hour per day. The author attributes this change, in large part, to the quality of programs geared toward each age group.

While several studies have examined the association between early television viewing and achievement, it is crucial to consider the type and quality of program exposure to gain a holistic picture of a child's TV diet. In a study that specifically set out to look at the television viewing of young children and its relationship with subsequent academic achievement, Zimmerman and Christakis (2005) found that viewing before 3 years of age negatively predicts academic tests scores. Conversely, viewing after 3 years of age is positively associated with test scores. The important takeaway point with this study is that, while it illuminates that timing of exposure may be crucial in understanding the effects of television on academic performance, these researchers did not distinguish between entertainment and educational content. Along similar lines, Barr and colleagues (2010) conducted a study on sixty families' early television exposure and later cognitive outcomes. Their results showed that exposure to adult-directed programming at age one was associated with poorer cognitive outcomes at age four. This is contrasted by the fact that viewing child-directed programming at age one was not associated with any outcome at age four, seeming to have neither a positive or negative influence. Though the researchers distinguished between adult and child directed programming, they did not consider program quality or the educational value of viewed content. Findings such as these illustrate that program type and quality can be very important in predicting subsequent outcomes.

To summarize, it is not clear that a significant relationship exists between children's overall time spent watching television (dosage) and academic achievement. In the case of general viewing, it is clear that amount of exposure and timing seems much more important than the content experienced from entertainment programming.

However, the concept of dosage becomes more complex when the quality of content is examined. These two perspectives, dosage versus content driven effects of television, will be examined as part of this dissertation project.

Television and Children's Behavior and Academic Confidence

Television, as a medium, offers children models to shape their understanding of how they should behave. Findings from a meta-analysis that examined the effects of television content on children's social behavior indicate small to moderate effects of violent television encouraging aggressive behavior as well as for prosocial television and the encouragement of positive social behaviors (Mares & Woodard, 2005). What follows is a brief discussion of how different forms of television can affect child behavior in different ways. As discussed previously, educational programming has the power to teach children important life skills. It is then equally possible to expect that other types of programming, specifically those that display antisocial or violent behavior, may influence children's behavior in a negative way.

Negative Effects of TV on Children's Behavior

A great deal of effort has been spent on clarifying the influence of violent television on children's social outcomes. In the field of communication, numerous content analyses of children's television indicate that violence is a pervasive theme in television shows geared toward children (e.g., Gerbner & Gross, 1976). The National Television Violence Study reported that 60 percent of all programs, spanning across network television, cable, public broadcasting, and premium channels, contained violence defined as "an act or threat of physical force intended to cause physical harm against an

animate being" (Smith et al., 1998). There is no doubt that aggressive models are available on a regular basis from television.

A number of behavioral studies have examined the link between exposure to violent programming and increased aggression in children (see Wilson, 2008 for a review). Empirical support for the effects of aggressive or violent television on children's behavior has been found in both the short and long term. In a classic experiment conducted by Bandura and colleagues (1963), researchers found that children exposed to an aggressive televised model were more likely to imitate aggressive play behaviors during free play following a viewing session. Boyatzis, Matillo, and Nesbitt (1995) found that children's aggressive behavior significantly increased after just one episode of a violent program. In other work that relies on more naturalistic observations, Josephson (1987) found that children previously exposed to violence on television could be primed for aggressive behavior when presented with cues associated with the violence demonstrated on TV. More recent studies that have examined neurological connections between violent media and cognitive tasks suggest that child subjects who played a violent video game for 30 minutes showed heightened activation in the amygdala and decreased activation in the medial prefrontal cortex, anterior cingulate cortex, and the dorsolateral prefrontal cortex as compared to subjects who played a non-violent game (Wang et al., 2009). The authors conclude that short-term involvement with violent games can change activation in brain circuitry, providing potential support for long-term hypotheses on behavioral change.

Several studies have provided evidence to suggest a long-term linkage between violent television exposure and aggressive behavior; however, the results on the basis of

child gender are inconclusive. One study shows that heavy exposure to violent programming at 8 years of age is associated with higher levels of aggressive behavior in 19-year-old boys (Eron et al., 1972). The same effect was not present for girls. The Recontact Study by Anderson and colleagues (2001) also found a long-term relationship with exposure to violent programming during the preschool years and increased aggression, but only for girls. In a more recent study by Huessman and colleagues (2003), over 500 elementary school children were interviewed about their television viewing habits and interviewed again 15 years later; results suggest a significant association between early violent television exposure and increased aggression in both boys and girls.

It is less clear how exposure to violent programming influences children's academic achievement. In a study of young children's viewing, Christakis and Zimmerman (2007) found that viewing violent TV during preschool years predicts antisocial behavior at ages 7 through 10. Previous work by Huesmann and Eron (1986) suggests that the effects of violent television on achievement flow through changes in children's behavior. They posited that violent TV is likely to be associated with aggression that can impose its effects on achievement through reductions in performance, overall academic output, and non-affiliation with a culture of achievement.

In sum, it is likely that there is more to quantifying children's television diets than simply the amount of high-quality educational programming they view. On the contrary, violent programming may also produce an influential effect on achievement by influencing children's social behavior.

Prosocial Effects of Educational Television

Prosocial television, on the other hand, provides role models of a different kind. Programs like *Sesame Street*, *Dragon Tales*, and *Mister Rogers' Neighborhood* have been found to model prosocial behavior to their young viewers, increase sharing and problem solving, and decrease aggression during free play (Bankart & Anderson, 1979; Friedrich & Stein, 1973; Hodapp, 1977; Rust, 2001). In a study by Friedrich and Stein (1973), preschool children were exposed to 12 episodes of *Mister Rogers Neighborhood*, *Batman*, or a neutral nature program over the course of 4 weeks. Results suggested that children who viewed *Mister Rogers* showed higher levels of self-control and task persistence. Among the low-income children viewers in particular, additional effects were found for increased cooperation, verbalization of feelings, and nurturing behaviors. These same behaviors were examined after a 2-week delay; effects were still present at follow-up, albeit the effects were slightly less strong than when measured immediately following the viewing period.

One of the key aspects, it seems, in learning prosocial behavior from educational television is the ability for children to transfer their knowledge about the televised example to real life. Many of the findings of children demonstrating prosocial behaviors are in close relation to the examples demonstrated by televised models. For example, in a study of preschool children who viewed a *Lassie* in which the title character rescues a puppy, Spratfkin, Liebert, and Poulos (1975) found that children were more likely to leave an activity with an incentive to help distressed puppies. Other research that examined the effects of viewing prosocial clips on generalized play behaviors did not find similarly strong results (e.g., Friedrich & Stein, 1975).

However, the takeaway message is that children are able to absorb prosocial messages from educational television. The interesting question that remains, however, is how long lasting the effects are on children's behavior over time. Findings from the Recontact Study suggest that, for boys, early exposure to violent programming was unrelated to aggressive behavior during the teen years (contrary to the findings presented earlier by Eron et al., 1972). However, this same study found that exposure to prosocial programming was associated with positive behaviors like extracurricular pursuits. Further work is necessary to fully understand the connection between early viewing and its influence on later behavior.

TV's Effect on Self-Efficacy and Student Achievement

Children's self-efficacy is an essential aspect of scholastic success. Children who believe that intelligence is a fluid ability end up performing much better in school than children who think that potential is fixed and unalterable (e.g., Finn & Rock, 1997; Willingham, Pollack, & Lewis, 2002).

There is great interest in understanding whether children's academic self esteem and self-efficacy is altered through early television viewing. While the focus of many programs is to educate children on various literacy, math, and social skills prior to school entry, many programs seek to build children's confidence and application of this new material to real world circumstances. Several program evaluation projects have revealed connections between viewing and increased academic confidence as well as positive attitudes toward learning. Programs like *Between the Lions*, *Reading Rainbow*, *Cyberchase*, and *Bill Nye the Science Guy* have been found to encourage children to ask for books seen on the shows, support increases in frequency of reading and free writing,

positive attitudes towards reading, science, mathematics, as well as children's overall interest in learning (Linebarger, 2000; Rockman Et Al., 1996; Rockman Et Al., 2002; Wood & Duke, 1997). It is possible that the effects of educational television viewing impose this effect on academic achievement through an increase in early academic self esteem. However, this indirect relationship has yet to be fully explored.

The Effects of Educational Television

How, then, does educational television exposure differ from entertainment content exposure? Before considering this question, it is important to address the definition of educational television. Some consider any television, either for entertainment or informative purposes, to be educational (Jordan, 2000). Historically, this definition is one that television networks and advocacy organizations have struggled with, using various terms like informational programming, edutainment, curriculum-based program, and others (Fisch, 2004). One could make the case that game shows like *Wheel of Fortune* or crime dramas like *CSI* are educational, as children may learn from their content. In a defining moment of broadcast history, the Children's Television Act of 1990 required networks to air educational programs for children. To alleviate the uncertainty of defining educational television, the Act defined educational/informational programs as "carrying content that will further the positive development of the child in any respect, including the child's cognitive/intellectual or emotional/social needs" (FCC, 1991). While this definition was a step in the right direction, controversy still swelled around the ability to interpret this definition differently. Cartoons that were created primarily for entertainment value (e.g., *The Flintstones*, *Yogi Bear*) were being labeled as

educational because they included prosocial messages (Kunkel, 1998; Kunkel & Canepa, 1995). It is clear that, while the Act provided guidelines for broadcasters to be thinking about the inclusion of educational programs, the decision about quality should not be left in the hands of individuals whose goal is to encourage viewership and ratings.

Refined definitions of educational programming have proved useful in contextualizing the differential effects of TV content on children's development. One defining aspect of many programs is the incorporation of empirical research into the development of the program. Using research-based curricula, formative/summative assessment, and/or the consultation of child development specialists, producers shape the format and content of their program to be appropriate for the target audience. By ensuring that teaching strategies that are successful in other contexts for learning (e.g., classroom, preschool), program producers ensure that the content of children's programs is relevant for their developmental age.

For the purposes of this project, educational television is defined as programs for which the "primary goal is to teach children specific skills and/or behaviors, eventually preparing them for more advanced, formal academic and/or social settings" (Vandewater, Cummings, & Lee, 2005). What will be explored now, albeit briefly, is how educational programming can influence viewers, particularly young children.

A great deal of research has focused on the acquisition of early learning and skills from educational television (for a review, see Anderson, Lavigne, & Hanson, 2013). Evaluations of *Sesame Street*, *Mister Rogers' Neighborhood*, and *Barney the Dinosaur* support the development of children's physical well being such as encouraging body awareness, proper hygiene, and stranger danger (Fisch & Truglio, 2001; Singer & Singer,

1998). To support language development, *Super Why*, *Martha Speaks*, and *Between the Lions* have been found to support positive gains in listening, vocabulary, and emergent literacy skills (e.g., story sense, early writing, and connection of letters and sounds) (Linebarger, 2000; Linebarger, McMenamin, & Wainright, 2010; Linebarger, Moses, & McMenamin, 2010; Linebarger & Piotrowski, 2009; Rice, Huston, Truglio, & Wright, 1990). General knowledge, defined by children's thinking and problem-solving abilities as well as math knowledge and propensity for imagination, consists of the basic knowledge children need upon school entry. With over 30 years of evaluation, *Sesame Street* has been found to support skills like letter recognition and early mathematical concepts (e.g Ball & Bogatz, 1970; Bogatz & Ball, 1972; Lesser, 1974).

Linebarger and Walker (2005) conducted a study to assess the relationship between young children's television viewing and subsequent language outcomes. Their results suggest that the content of children's television is crucial in predicting language progress during the preschool years. The authors found that early viewing of certain programs (e.g., *Dora the Explorer, Arthur, Clifford, Dragon Tales, Blue's Clues*) was related to larger vocabularies and higher expressive language scores.

Older children and adolescents can also benefit a great deal from educational media. After a six-month period of exposure, children who viewed the *The Electric Company* in a school environment showed significant gains on a variety of skills related to reading and comprehension (Ball & Bogatz, 1973). A longer-term follow up study on these same children revealed that those who viewed *The Electric Company* series demonstrated gains above non-viewing peers (Ball et al., 1974).

Mathematics skills in school-age children are also enhanced by educational television. An assessment of a program called *Infinity Factory*, a mathematics series geared toward 8 to 11 year olds, showed that viewers demonstrated significantly higher gains on a math post test as compared to non-viewers; furthermore, White children had higher gains than non-White peers (Harvey, Quiroga, Crane, & Bottoms, 1976 as cited by Fisch, 2004). Another popular math series with school age children, *Square One,* has been found to support children's recall of problems and solutions, understanding of math concepts, and transfer of learning to novel problems (Peel, Rockwell, Esty, & Gonzer, 1987 as cited by Fisch, 2004). A summative evaluation of *Cyberchase* provided evidence for increased mathematical problem solving and sophistication of solutions obtained through problem solving in viewers (Fisch, Lesh, & Crespo, 2010).

To summarize, it is clear that we see benefits of educational programming across childhood. However, most of the studies discussed above have examined the short-term effect of programs on child learning and behavior very close to the period of exposure. Most of the available TV effects research discussed above has drawn from short-term experimental studies or research that correlates viewing time with behavior change. Because of this, it is difficult to draw meaningful connections with the amount of television exposure and long-term changes in behavior. A number of the studies focused on specific television programs were conducted as formative or summative assessments that were never published in refereed journals. One may question whether appropriate controls were taken into account for pre/post assessments that focus on the effectiveness of a TV program in developing children's skills.

Given that a great amount of federal funding is provided for educational programming directed at young children, it is no surprise that the lion's share of research focuses on short-term effects of program viewing (e.g., Corporation for Public Broadcasting, 2011). The field lacks a large-scale longitudinal investigation of children's exposure to television, possible mediating factors, and the corresponding associations with adolescent achievement.

Educational TV and Later Achievement

Longitudinal investigations are an ideal method to assess the impact of educational interventions. They allow researchers to follow children over an extended period of time, monitoring progress as they develop while appropriately controlling for factors like SES, parent education, quality of the home environment, among other important variables. Yet, longitudinal designs are both time-consuming and expensive. Therefore, it rarely serves the purpose of television producers to invest in studies of this kind for the purpose of evaluating the impact of a program. There are but a few studies that look at the impact of educational television on children's academic achievement over time.

The Early Window Project. Conducted over three years, the Early Window Project assessed the impact of educational TV (specifically *Sesame Street*) on 250 low-income children's school readiness (Wright & Huston, 1995; Wright et al., 2001). Approximately 40 percent of their sample was European American, 40 percent African American, and 20 percent Hispanic. Children in two cohorts, ages 2 to 5 and 4 to 7, were assessed across four separate waves for their reading/math ability, vocabulary, school readiness, and school adjustment measures. Paired with the collection of time-use diaries

over several years, researchers found that viewing educational television between two and five years of age showed a significant positive contribution to reading and school readiness outcomes beyond that accounted for by parent education, family income, preschool attendance, child's primary language, and an assessment of the home environment as measured by the HOME inventory (Wright & Huston, 1995; Wright et al., 2001). Child viewing of adult programs and non-informative children's television (cartoons) were negatively related to time spent on educational activities.

Educational Media and Reading Competency. A shorter-term longitudinal study conducted by Ennemoser and Schneider (2007) examined the relationship between television viewing and the development of reading competency among German children. Over a period of four years and across two age cohorts, children's television viewing habits were regularly monitored via time diaries, particularly for distinctions in exposure to entertainment versus educational TV content. Results suggest that the viewing of educational television programs was associated with higher reading competency whereas a negative association was present for viewing entertainment programs. However, it should be noted that the correlations found within this study between reading achievement and educational television viewing were not statistically significant. The authors attribute this to the fact that their German children participants, who average approximately one hour of television per day watch considerably less than their American counterparts. They suggest that their results are consistent with those found in other longitudinal American studies. Additional analyses within their study suggest that, when children are grouped according to light, medium, or heavy TV viewing patterns, medium-level TV viewers perform the best academically.

The Recontact Study. The Recontact Study provides further support for the positive relationship between the viewing of educational television and subsequent academic achievement. This study's effects, however, extend into the high-school years (Anderson, Huston, Schmidt, Linebarger, & Wright, 2001). This project followed 570 adolescents whose television viewing habits had been studied previously as preschoolers. Telephone interviews and high school transcripts provided data on student grades, participation in extracurricular activities, and other behaviors. Results suggested that children who watched more informative television during the preschool years tended to have higher grades in high school, spent more spare time reading, and, for boys in particular, decreased adolescent aggression. Alternatively, violent television viewing in preschool was associated with lower grades, higher aggression in girls, and less participation in activities that cultivate leadership skills. These effects were consistent after incorporating average parent education, sex of the child, and birth order.

In summary, longitudinal studies that examine the impact of educational TV on the development of academic and behavioral outcomes have mainly been formulated in a way that shows the value of TV, but not often in relation to other environmental or contextual factors. Embedding educational television viewing in models that look at a child's environment would allow for some comparisons to be drawn as to the value of educational media for children in different situations, particularly with a nationally representative sample.

Gaps in the Research Literature

Much of the published literature in the domain of children's learning from television focuses on the short-term gains from educational television viewing. It is

widely known and supported that children learn valuable academic and socio-emotional skills from programs such as *Sesame Street*, *Mister Rogers Neighborhood*, *Barney the Dinosaur*, and *Between the Lions*. However, many of the studies that have examined the effects of these programs were commissioned evaluation projects that, often, do not publish their research in peer-reviewed journals. Even fewer studies have examined the long-term impact of educational media on children's academic skills in relation to other important educational and contextual variables. Several longitudinal studies, discussed previously, have attempted to examine the long-term effects on educational media viewers. The Early Window Project suggests that early preschool educational television viewing predicts school readiness (Wright et al., 2001). Ennemoser and Schneider (2003) suggest that it is possible for educational television to influence children's reading achievement. The longer term longitudinal Recontact Study suggests that consistent viewers of *Sesame Street* during the preschool years had significantly higher grades and better prosocial outcomes than non-viewing high school peers.

Yet, several limitations are present in these studies. For the Early Window Project, researchers did not include weekend diaries in the estimation of children's television viewing. It is possible that children's TV viewing estimates were under-represented by not examining days of the week where families, presumably, have a greater proportion of leisure time. The Recontact Study is limited in its generalizability to the larger population, as its findings were drawn from two communities that are not representative of the nation, being overwhelmingly White, working/middle class, and generally comprised of 2-parent families (Anderson et al., 2001). The Ennomoser and Schneider (2007) reading study was also limited in its sample size, such that they chose

to focus on breadth of assessment with a smaller number of children rather than a broader sample size. In addition, their findings were drawn from a sample of German children who have lower levels of television viewing, on average, than their American counterparts. In all of these studies, children were not monitored between their measurements of television viewing and later achievement, eliminating the possibility of assessing any interesting mediational relationships between television diet and later achievement.

The next step toward understanding the full potential of educational television is an increasingly robust examination of the long-term impacts of a varied educational media diet during the formative years, and its effects on academic outcomes as children age throughout childhood.

Overview of the Study

The aim of this dissertation project was to investigate the impact of children's early television exposure on achievement in adolescence. Using CDS data from the PSID, children's television consumption patterns were assessed using diary data reported by children and/or their parents in 1997. Analyses explore the relationship between early viewing and later achievement and whether the effects of educational TV viewing on achievement diminish or endure over time.

Research Questions

From a review of the available literature, several questions were the focus of this dissertation project.

1. Does time spent viewing educational TV or violent TV during the early years predict achievement in adolescence? More succinctly, does TV dosage predict differences in

achievement processes? Displacement theory posits that children's time spent with television lessens time spent on more cognitively-stimulating activities such as reading or creative play. On the contrary, evidence from the Early Window Project and the Recontact Study has shown that time spent watching educational television during early childhood is positively associated with school readiness and later achievement. However, due to limitations in sample diversity and size, it is questionable as to whether these effects apply to the population as a whole. In this dissertation, models examining the effects of television dosage examine the differential influences of time spent with educational and violent TV on intermediate academic and behavioral outcomes as well as long-term achievement outcomes. Direct effects from educational television viewing are tested on reading and math achievement, as well as the indirect effects on achievement through time spent reading, reading self esteem, math self-esteem, prosocial behavior, and behavior problems. These relationships shed light on whether time spent with television displaces certain kinds of positive experiences that lead to positive behavior and achievement.

2. Does quality of viewing diet (educational or violent television) during the early years predict variability in adolescent achievement outcomes above and beyond dosage effects? As previously discussed, the effects of television are variable depending on the type of content viewed. This second set of models will test whether diet variables measured during the early years (ages 3 to 8) predict differences in academic or behavior variables in 2002 or differences in educational outcomes in 2007. By creating proportion scores of the amount of time spent viewing educational TV of their total time spent viewing, it is possible to predict achievement from a measure of children's TV diet quality rather than

a calculated average of minutes per week. Direct effects from TV viewing are tested on reading and math achievement, as well as the indirect effects on achievement through time spent reading, reading self esteem, math self esteem, prosocial behavior, and behavior problems.

3. Do aspects of the child and his/her environment (i.e. gender, age, or socioeconomic status) influence the relationships (dosage and diet) between TV viewing and adolescent achievement? Previous research has demonstrated the importance of child predictors on estimates of children's television viewing (e.g., Lin, Bartolic, & Vandewater, 2009). Often, the sex of the child and/or socioeconomic status are used as control variables when fitting longitudinal models predicting achievement from TV use. In this project these important relationships will be examined as effects of interest rather than removing variance in the outcome. Family context variables will be included in a series of nested models to examine whether adding environmental or family context information significantly improve the fit of our longitudinal models of child achievement.

4. If significant longitudinal relationships are supported between early educational TV viewing and achievement, do effects support a revisionist or an enduring effects model?

The legacy of educational media viewing experiences and how they are carried forward through time have yet to be investigated. While the available longitudinal research suggests that early viewing experiences are associated with later achievement, most studies examine long-term effects over the course of only two time points. As a result, it is less clear how important this influence is over time. Is the learning achieved through educational media a unique and enduring effect across development? To use the language of Fraley, Roisman, and Holtigan (2013), do early media experiences serve as

an “anchor” in the child’s developmental pathway? According to the authors, if this were true, the revisionist perspective, which hypothesizes that early experiences are overwritten by later experiences in life, would serve as the appropriate model for educational TV viewing. In contrast, Fraley and colleagues suggest that, in an enduring effects model, the relationship maintains the same strength over time. Using longitudinal data, this research question examines whether the revisionist or enduring effects models are appropriate theoretical models when predicting children’s achievement outcomes in reading and math.

CHAPTER II

METHOD

Data

Data collected through the University of Michigan's PSID were used for these dissertation analyses (Panel Study of Income Dynamics, 2013). Beginning in 1968 and continuing into the present, the PSID has monitored over 18,000 individuals in 5,000 families from across the United States. Originally, the PSID was formulated to collect household level data spanning topics such as education, employment, wealth, health status, marriage, and family size (Hofferth, Davis-Kean, Davis, & Finkelstein, 1998). These data are publicly available through the University of Michigan's Institute for Social Research. For data access, one must register with the Institute and abide by rules for public release data. The identity of all study participants is protected and, for this set of analyses, sensitive participant identifier information is not required[2].

In 1997, the University of Michigan formulated the Child Development Supplement (CDS) to collect additional developmental information from children and their parents in PSID households. Heads of household were surveyed for their perceptions of children within the family unit. Up to two children from each household were eligible for participation. A detailed description of the survey's methodology and, specifically, the implementation of the CDS are presented below.

[2] The IRB at the University of Massachusetts was consulted as to whether to the project required a protocol be submitted. Because the analyses contained in this project used de-identified data, protocol approval was deemed unnecessary. The IRB agreed to issue a memo confirming this determination. See Appendix A for a copy of the memo.

Sample

According to PSID documentation, 2,394 families were surveyed in CDS-I and information on 3,563 children was obtained (Hofferth et al., 1998). Families were re-contacted five years later in 2002 (CDS-II), at which time 2,021 families provided information about 2,907 children. In 2007, families were contacted a third time (CDS-III), at which point 1,676 families provided information on 1,506 children/adolescents. The richness of this data set allows for analyses of children's development over time through use of CDS data paired with household level demographic information from the head-of-household PSID questionnaire.

When the CDS was first implemented in 1997, the PSID core sample was refreshed to include more immigrant families. These families added approximately 250 immigrant children into the CDS sample for 1997 (Hofferth et al., 1998). Table 1, as previously shown by Hofferth and colleagues (1998) shows the breakdown of CDS-I children and families by gender and ethnicity.

For several of the research questions proposed as part of this project, a sub-sample was selected from the full sample of PSID families. As several questions of interest are related to children's early television viewing, a sample must be selected for individuals that have TV time-use data early in life as well as information about academic performance during adolescence. Therefore, CDS children were considered eligible if they were born between the years of 1992 and 1996. This put them within the age range of 3 to 8 during the 1997 CDS-I data collection period. Subsequently, these same children were ten years older for the 2007 CDS-III data collection; children's outcomes were examined when they were between 13 and 18 years of age.

The 1997 CDS-I contains a sub-sample of 1,331 children within the age range of three to eight (230 three year olds, 248 four year olds, 212 five year olds, 229 six year olds, 213 seven year-olds, and 199 eight year olds). This data set also contains the possibility of having two siblings from the same family. In order to reduce any possible confounds with the analysis of sibling data, if a family has more than one child within this age range in the CDS sample, the youngest child from each family was chosen for participation.

PSID Questionnaires

The "head of the household unit" (HOH) for each PSID core sample family was administered an interview protocol every other year for the duration of this study (1997,1999, 2001, 2003, 2005, 2007). Data for each year of CDS implementation are available for these analyses.

During the PSID core sample survey, the experimenter asked the HOH an extensive series of questions about various aspects of the household. Major categories of interview topics included housing conditions, home finances, employment of self and significant other, reliance on government subsidy, income, health, marriage and children, education, family history, and ethnicity.

For each CDS wave, a demographic and economic contexts data file is available to link core PSID sample families to CDS data. Variables of interest are described in the sections below.

Child Development Supplement (CDS)

Beginning in 1997, researchers added the Child Development Supplement (CDS), a tool that provides a comprehensive set of assessments to examine children's academic preparedness. At the current time, three waves of time-use data have been collected (1997, 2002, and 2007) during which various instruments were used to collect data on children's health and wellness, achievement, behavioral problems, among many other topics. Each wave of data collection took approximately 11 to 12 months to complete (Hofferth et al., 1998). Below is a description of several data collection instruments and how each was implemented with the child or an individual close to the child.

Primary Caregiver for Child. During each wave, the primary caregiver for the child was administered an extensive interview protocol by a trained PSID researcher. In this interview, the parent was asked about various aspects of the child's current health status (height, weight, current medical conditions, availability of health care), family lifestyle, parent/child activities, schooling, and use of childcare, among other topics of interest. The interview was tailored with a different series of questions depending upon the age of the child (0-3, 3-5, 6-9, 10+). Parents were surveyed about the activities their child takes part in inside/outside the home and what kinds of opportunities the child is given to make their own decisions. Caregivers were also asked to describe their typical parenting practices in developmentally relevant situations. The interview concluded with the researcher conducting the short form of the HOME Inventory (Caldwell & Bradley, 1984).

Primary Caregiver for Household. A separate interview protocol was conducted to ask the primary caregiver (PC) about the home environment. During this portion, the primary caregiver was asked questions about the characteristics of their neighborhood, whether they receive various kinds of support for their parenting, and their feelings about capability in managing the household. In addition, they were also given a series of questions to assess the challenges they face in parenting and what kinds of rules they set within the household for their children. Other assessments include a scale measuring the division of labor in the household and several items that assess the mental health status of the PC.

Time Diaries. Activity time diaries were implemented in all three CDS waves. For this instrument, primary caregivers (or when appropriate, the child with the help of an adult) were asked to record the child's activities and time-use over the course of a 24-hour period for one weekday and one weekend day (see Appendix B for sample instrument). The diary asked the individual to record each activity the child engaged in during the day, the time it began, the time it ended, where they were, who was with the child, who was there but not directly involved in the activity, and if the child was doing something else simultaneously during this activity. If the diary entry was a media activity (e.g., watching television, playing video games, etc.) the PC was asked to record the program or game title.

For television viewing activities, research coders followed a coding scheme developed by Vandewater, Cummings, and Lee (2005) and designed to code for several elements of the program (see Appendix C). For each television entry, data were recorded by PSID researchers for the format of the program (live action, animation, combination),

intended audience (children, adolescents, adults, general), character age (no character, children, 'tweens', adolescents, adults, cross-age), program genre (entertainment news, nature, reality, talk, variety, daily life, case solving, action/adventure, horror, daytime soap, music video, sports, documentary, children's education, network only, channel only), curriculum (prosocial, school readiness, extended, informal), and for violent content (slapstick, sports, victimization, gratuitous, or ultra violence; see Appendix C for definitions). These categorical codes will allow for the assessment of children's TV diets that incorporate measurements of viewing quantity as well as an assessment of how much educational and/or violent material they viewed during the diary implementation period.

Television program content coding is available for CDS-I and CDS-II. CDS-III contains information about how much television the child viewed for one weekday and one weekend-day; however detailed content coding was not made available through the CDS-III data set at the current time.

While efforts have been made using the PSID's child development and time-use data to look at developmental outcomes like aggressive behavior, social isolation, and obesity (Bickham, Vandewater, Huston, Lee, Caplovitz, & Wright, 2003; Vandewater & Bickham, 2004; Vandewater, Bickham, & Lee, 2006; Vandewater & Huang, 2006), few studies have examined the connection between PSID time-use diary data and later achievement. One study conducted by Shin (2004) used structural equation modeling to examine three different hypotheses on the way television viewing affects academic outcomes. The model's television variable was represented merely by an hours per day viewing average, ignoring any delineations between the types of programs children viewed. However, as shown by Christakis and Zimmerman (2007) with the PSID data,

quality of television does matter in predicting later prosocial outcomes through their finding that viewing violent TV during preschool years predicts antisocial behavior at ages 7 through 10. Therefore, for this project, more complex modeling accounts for both the quality and quantity of children's media exposure.

Child Assessments. In 2002 and 2007, trained PSID researchers interviewed each PSID child on a variety of additional topics. Children were asked to describe their feelings about the future, relationships with family members, extracurricular activities, and opportunities for work. In both CDS-II and CDS-III, children also took part in a self-administered questionnaire via computer that asked about risky behaviors (e.g., drinking, tobacco use, sexual activity), mental health, and educational aspiration. At each time point, the child selected for participation was also interviewed by a trained researcher and given several cognitive assessments.

For a full outline of CDS data collection procedures, please see Appendix D from (Hofferth et al., 1998).

Variables for Analyses

Demographic Variables

Socioeconomic Status. Significant associations have been found between childhood poverty and various cognitive and behavioral outcomes in children. For example, Duncan, Brooks-Gunn, and Klebanov (1994) found a significant relationship between childhood poverty and IQ at age 5 as well as child behavior problems. It has also been previously suggested that socioeconomic status predicts differing types of media diets in children. For example, low income families report viewing educational media

more often than high-income families (Common Sense Media, 2011).

As mentioned previously, Lee, Bartolic, and Vandewater (2009) reported that the quality of the family environment is a significant predictor of children's media use. As one indicator of SES, the abbreviated form of the Caldwell and Bradley (1984) HOME Observation for Measurement of the Environment is used to represent the environmental context aspect of SES. According to PSID documentation, this measurement was collected to represent the support and environmental stimulation parents provide to their children (Hofferth et al., 1998). The scale contains questions from the primary caregiver survey along with assessments collected during a home visit by the observing researcher. Families' raw scores for the Home Inventory Cognition Stimulation subscale will be used as the indicator these analyses. Another predictor is the Head of Household's highest level of educational attainment, found to be highly related to socioeconomic status in a number of previous studies (National Center for Education Statistics, 2012).

In later longitudinal models, each family's income-to-needs ratio was tapped as a measure of socioeconomic status. This measure was calculated using the family's income over the poverty level from the United States Census Bureau (procedure as outlined by Vandewater & Bickham, 2004). This variable was calculated for each data wave: 1997, 2002, and 2007.

Time-use/Activity Diaries from 1997

Information from children's time use diaries from 1997 is used to assess television-viewing diet during early childhood. Raw data is provided at the event level (e.g., each record is one recorded activity for a child). Syntax previously implemented by Lin, Bartolic, and Vandewater (2009) was used to aggregate diary data at the individual

level (see Lin et al., 2009 for study details). Time variables of interest include averages of children's TV viewing for total number of hours per week, number of hours spent viewing child-directed educational television, and number of hours spent viewing violent programming. Diet variables were also calculated for educational television diet and violent television diet. For each the type of TV content was used as the numerator divided by children's total time spent viewing television during that week.

These TV viewing data were used for structural equation models to predict adolescent achievement at the 2007 data wave as well as for longitudinal modeling that predicts enduring versus revisionist effects of TV on cognitive ability and prosocial *behavior.*

Child Measures in 2002

Task Perception. Children over the age of 8 were also given a Task Perception test at each time point that combined items from scales developed for academic self esteem assessment (Eccles, Wigfield, Harold & Blumenfeld, 1993). During this assessment, children were asked to report self-perceived ability in math and reading. On a scale of 1-7 with one being one of the worst, 4 in the middle, and 7 bring the best, children were asked how good they are in each subject, how difficult the subject matter is to learn, how much they like the subject. A total of ten questions were asked for reading and another ten for math. Subscale scores represent children's reading self esteem and math self esteem in 2002.

Behavior Problems. A Behavior Problem Index assessment, as reported by the child's primary caregiver, is used to represent children's behavior (Peterson & Zill, 1986). This scale represents the primary caregivers' reports as to how often, sometimes,

or never the behaviors described characterize the child. Behaviors are divided up into two subscale scores: internalizing and externalizing behavior problems. Both are used as variables to represent behavior problems. For each, the higher the total measure, the higher children's propensity is for behavior problems.

Prosocial Behavior. As it is believed that educational television and violent television will have variable effects on children's behavioral outcomes, it is best to include measures of both positive and negative behaviors. The Positive Behavior Scale (Polit, 1998) is used to represent children's prosocial behavior. Previous research suggests that the original 25-item scale taps three dimensions of child behavior: compliance/self-control, social competence/social sensitivity, and autonomy (Hofferth et al., 1998). A 10-item subscale was created for usage with the PSID-CDS; subscale scores with higher values representing more prosocial behavior.

Child Academic Outcomes in 2007

Achievement. During the CDS-III data collection period (2007) three subtests of the Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R) were administered to the child to represent the Letter-Word Identification, the Passage Comprehension, and the Applied Problems tests (Woodcock & Johnson, 1989). These tests can be used as separate subscale scores or, when appropriate, can be summed for Broad Math and Broad Reading ability (Hofferth et al., 1998). These assessments provide age-graded scores that will allow for an examination of the child's reading and math achievement during adolescence. The Letter-Word Identification test assesses the child's symbolic learning while Passage Comprehension measures vocabulary skills and understanding of text. The Applied Problems test measures the child's ability to solve mathematical problems

(Hofferth et al., 1998). Letter-Word Identification and Passage Comprehension are used in this dissertation as indicators of Reading Achievement. Applied Problems is the sole indicator of Math Achievement. Standardized scores for all three measurements are used as outcome variables of achievement.

Hypotheses and Expected Results

Testable hypotheses and expected results are listed by research question below.

1. Does time spent viewing educational TV or violent TV during the early years predict achievement in adolescence? More succinctly, does TV dosage predict differences in achievement processes?

1a. Total time spent reading in 2002 will positively predict reading self esteem in 2002 and reading achievement in 2007.

1b. Reading self esteem and positive behavior in 2002 will positively predict reading achievement in 2007.

1c. Math self esteem and positive behavior in 2002 will positively predict math achievement in 2007.

1d. Internalizing and externalizing behavior problems in 2002 will negatively predict reading and math achievement in 2007.

1e. Number of hours of educational TV viewing in 1997 will positively predict independent reading, reading self esteem, math self esteem, and prosocial behavior in 2002.

1f. Number of hours of educational TV viewing in 1997 will be negatively associated with internalizing and externalizing behavior problems in 2002.

1g. Number of hours of educational TV viewing in 1997 will be positively associated

with reading and math achievement in 2007.

1h. Number of hours of violent TV viewing in 1997 will negatively predict independent reading, reading self esteem, math self esteem, and prosocial behavior in 2002.

1i. Number of hours of violent TV viewing in 1997 will positively internalizing and externalizing behavior problems in 2002.

1j. Number of hours of violent TV viewing in 1997 will be negatively associated with reading and math achievement in 2007.

2. *Does quality of viewing diet (educational or violent television) during the early years predict variability in adolescent achievement outcomes above and beyond dosage??*

2a. Total time spent reading in 2002 will positively predict reading self esteem in 2002 and reading achievement in 2007.

2b. Reading self esteem and positive behavior in 2002 will positively predict reading achievement in 2007.

2c. Math self esteem and positive behavior in 2002 will positively predict math achievement in 2007.

2d. Internalizing and externalizing behavior problems in 2002 will negatively predict reading and math achievement in 2007.

2e. Total number of TV hours per week in 2002 will positively predict internalizing and externalizing problems in 2007.

2f. Total number of TV hours per week in 2002 will negatively predict independent reading time in 2002, positive behavior, and reading/math self esteem.

2g. Educational TV diet 1997 will positively predict independent reading, reading self esteem, math self esteem, and prosocial behavior in 2002.

2h. Educational TV diet 1997 will be negatively associated with internalizing and externalizing behavior problems in 2002.

2i. Educational TV diet in 1997 will be positively associated with reading and math achievement in 2007.

2j. Violent TV diet in 1997 will negatively predict independent reading, reading self esteem, math self esteem, and prosocial behavior in 2002.

2k. Violent TV diet in 1997 will positively internalizing and externalizing behavior problems in 2002.

2l. Violent TV diet in 1997 will be negatively associated with reading and math achievement in 2007.

3. Do aspects of the child and his/her environment (i.e. gender, age, or socioeconomic status) matter in predicting the relationship between TV viewing and adolescent achievement?

3a. A model adding demographic predictors (parent education and the home environment) will show a significant improvement in model fit over the non-demographic dosage model.

3b. A model adding demographic predictors (parent education and the home environment) will show a significant improvement in model fit over the non-demographic diet model.

3c. Parent education and the Cognitive Stimulation Scale from the HOME Inventory will negatively predict total time spent with television.

3d. Parent education and the Cognitive Stimulation Scale from the HOME Inventory will positively predict time spent with educational television and educational TV diet.

3e. Parent education and the Cognitive Stimulation Scale from the HOME Inventory will

negatively predict time spent with violent television and violent TV diet.

3f. Results from hypotheses 1a through 1f will not be different by child age in 1997 (older versus younger); the relationships should be the same, as the older children in the study likely held similar TV-viewing habits as younger children, thus not creating a different trajectory than the younger children they are compared to in this study.

3g. Results from hypotheses 1a through 1f may differ by gender, particularly through the violence diet variables, such that girls have higher levels of externalizing behaviors in 2002 as a result of violent TV diet.

4. If significant relationships are supported between early educational TV viewing and achievement, do effects support a revisionist or an enduring effects model?

This third set of analyses focus on modeling the effect of early TV viewing on children's achievement in order to determine whether the influence of TV on cognition follows a revisionist model versus one of enduring effects. Following the systematic procedure of Fraley, Roisman, and Holtigan (2013) a series of structural equation models were fit to test the pattern of influence from early television viewing (as measured in 1997) on children's scores on Woodcock-Johnson measurements over time (Woodcock & Johnson, 1989). Using data from the youngest cohort of this study, children ages 3-5, a stability model was first fit to ensure that achievement is a stable measurement over time. Then, a series of nested models was fit to determine whether significant effects are present from early TV viewing to achievement as measured in 1997, 2002, and 2007. It was predicted that if significant effects are only present in 1997 but not in subsequent years, evidence will be found for the revisionist perspective, suggesting that early educational television viewing influences children's achievement early in life, but the

effects are overwritten by other influences as development progresses. However, if effects are also present on achievement at 2002 and/or 2007, evidence for an enduring effects model will be found. This model would suggest that early educational television viewing is still important as children move through development.

4a. In testing longitudinal models between early TV viewing and children's achievement, it is expected that reading and math achievement will be stable measurements over time.

4b. While controlling for SES (in the form of income-to-needs ratio, it is hypothesized that the relationship between educational TV viewing (both number of hours and the proportion of educational to total viewing) and achievement (reading and math respectively) follows an enduring effects model, showing significant positive relationships for all three time points of measurement, with the magnitude of the effect becoming smaller over time. The rationale behind this hypothesis is based on the findings of the Recontact Study that the effects of early educational TV viewing are long lasting well into adolescence.

Method of Estimation

Path analysis in LISREL 8.80 was utilized to assess the relationships described above (Boomsma & Hoogland, 2001). All models were fit using Robust Maximum Likelihood with children who have a complete set of data. For additional details on this method of estimation as well as a report of differences by method of estimation (Full Maximum Likelihood versus Robust Maximum Likelihood), see Data Analysis and Sensitivity Analysis sections below.

Table 1

Composition of CDS Participating Families by Race and Gender (Hofferth et al., 1998)

	Total Families	Total Children	Male Children	Female Children	% Children by Race
White	1140	1648	827	821	46.03%
Black	997	1467	772	695	40.98%
Hispanic	158	268	134	134	7.49%
Asian	46	63	31	32	1.76%
Native American	12	19	8	11	.53%
Other	29	107	50	57	2.99%
NA/DK	7	8	4	4	.22%
Total	2389	3580	1826	1754	100%
Missing	1	6			

CHAPTER III

RESULTS

Sample Descriptives

Children were selected based on their age at assessment in 1997; children ages 3 to 8 were targeted for analysis. Family units, based on assigned 1997 PSID Family Interview numbers, were then examined to identify where multiple children were assessed from any given family unit. For the purposes of this project, the dependency issues related to assessing siblings from the same family were removed by selecting the youngest child in the family for inclusion in the sample. Two hundred forty-five (245) siblings of appropriate age were removed from the sample. The result: 1090 children, ages 3 to 8, were identified as potential subjects.

As this project is interested in examining the effects of early television viewing on a typically developing sample of children, survey data was assessed to identify any children with visual and/or hearing difficulties and whether any children had been diagnosed with severe learning disabilities at entry into the study. Thirty-two children were identified by these criteria and removed from the sample.

A breakdown of the full final sample by age, gender, and ethnicity can be found in Tables 2 and 3. In majority, the sample is comprised largely of preschool children with approximately 63 percent being children ages 3 to 5. The ethnicity makeup of the sample was primarily white (~50%) and black (36%) children. The average number of children per family unit was 2.14 with a median of 2 (47.2% of families). One hundred sixteen families had only one child (24.6%), 103 families had 3 children (21.8%), and 30 families had 4 or more children (6.4%t). Most of the children (90.3%) in the sample

were biological relatives or adopted children of the PSID Head of Household (HOH); frequencies on children's relationship to the HOH can be found in Table 4.

Participating families were generally spread across the United States with the most coming from the South Atlantic (23.1%, n = 109) and East North Central (16.9$, n = 80) regional divisions as defined by the United States Census Bureau (United States Census Bureau, 2010). A full report of participants by demographic region can be found in Table 5.

When the HOH was asked about their "couple's status", 67.2 percent (n = 317) were reported as head male with wife in family unit, 26.7 percent (n = 126) was head with no partner present in the family unit. 4.7 percent (n = 22) were head with "wife" in family unit and 1 percent (n = 6) was head with cohabitor. Less than one percent reported as a female head of household (n = 1). The average total family income in wave 1 was $46,329.07 with a median of $39,066.50 and a mode of $32,000. Descriptive statistics for the sample can be found in Table 6.

Only participants that have a complete set of data were used for this project (n = 472). In order to determine whether this project's final sample was different from those excluded from analyses due to incomplete data (n = 586), independent samples t-tests were run on demographics and relevant model variables. On average, children excluded from the analyses were slightly older than the current sample children (5.63 versus 4.61). Children in the sample had statistically higher ratings on the HOME Inventory Cognitive Stimulation Subscale (10.87 versus 10.42), higher hours of educational TV exposure (2.14 versus 1.72), and educational diet (.18 versus .14) in 1997. Sample children also had higher reading self esteem in 2002 as compared to excluded children (5.40 versus

5.23). A full report of comparisons, including sample and non-sample comparisons of ethnicity and gender, can be found in Tables 7 and 8.

Data Analysis

Analyses of the data described above include descriptive statistics, reliability analysis, and path analyses to test hypotheses of interest.

Descriptive analyses were done with television diary data to assess relationships between the TV variables, family demographic predictors, and achievement. In the examination of the TV dosage and diet predictors (hours of each type of viewing, proportion of viewing that is educational and proportion of viewing that is violent), it was noticed that a large number of children possessed zero values for educational and/or violent content creating non-normal distributions (see Figures 1a through 1e). The question was then raised as to whether a qualitative difference was present for families that could be considered "viewers" of educational television or violent television. To test this question, dichotomous coding was done to create a viewer versus non-viewer variable for both educational and violent TV diets. Then, independent samples t-tests were conducted on a variety of demographic measures to determine whether viewer and non-viewer families were statistically different. The full results can be found in Tables 9 and 10.

In sum, educational diet viewers only differed from their non-viewer counterparts on parent education for the head of the household (12.96 for viewers versus 12.49 for non-viewers) and on the Cognitive Stimulation Scale of the HOME Inventory (10.89 for viewers and 10.45 for non-viewers). Most importantly, when these parents were asked to

estimate how much television their children watch on a typical weekday and weekend day, viewer and nonviewer parent reports did not significantly differ (2.90 hours for viewers versus 2.80 hours for nonviewers on weekdays; 3.60 versus 3.78 for viewers and nonviewers on weekends, respectively).

The only variables on which viewers and nonviewers of violent programming significantly differed from viewers were on parent education (12.90 for viewers versus 12.40 for nonviewers) and on total TV hours per week (16.06 for viewers versus 11.16 for nonviewers). As these are important variables in the longitudinal models, these results are consistent with hypotheses on variables that would predict TV consumption patterns. Violent viewing versus nonviewing TV diet families did not significantly differ on parent estimates of weekday TV viewing (2.92 versus 2.73 hours for viewers versus nonviewers) or weekend TV viewing (3.78 versus 3.56 hours for viewers versus nonviewers).

As a result, it was determined that viewers and non-viewers of educational programming or violent programming did not differ in ways such that a zero value on diet should be considered any different than a small dosage. However, an assumption of structural equation modeling is multivariate normality, therefore, the inclusion of zero-inflated predictors may lead to violations of model assumptions (Kline, 2010). It has been suggested that, under conditions of multivariate non-normality, Maximum Likelihood estimation produces the correct coefficient estimates but biased standard errors. Therefore, models will be estimated under Robust Maximum Likelihood (RML) in LISREL 8.80 (Jöreskog and Sörbom, 1996). Utilizing RML will increase the likelihood of obtaining accurate tests of significance. Due to the need for complete data under RML

estimation, analyses were conducted with individuals who possess a complete set of data.

Reliability Analysis

Prior to conducting the proposed path analyses, the reliability of model measures was assessed. When possible, Cronbach's alphas were calculated on measures with available item-level data for this specific sample of children. The alpha levels for the Positive Behavior Scale (α= .84), Internalizing Behavior Problems (α = .85), Externalizing Behavior Problems (α = .89) and reading self esteem scale (α = .71) reached expected levels of reliability. The math self esteem scale (α= .64) was lower than a typical threshold of acceptability so parameter estimates involving this scale should be considered accordingly.

Other variables in the model have been taken directly from the PSID Data Center as composite scores; however, previous reliability assessments for each have been considered. The Woodcock Johnson Battery – Revised has been validated with preschool, school age, college, and adult populations and has established reliabilities between .87 and .93 for each battery subtest (Hofferth et al., 1998; Taylor, 1989). Reliability analyses conducted with the whole PSID CDS population suggested alpha levels of .83 on the WJ-R subscales (Shin, 2004). The HOME Inventory has been previously validated with infants, children, and various ethnic groups (Bradley & Caldwell, 1979; Bradley & Caldwell, 1981; Elardo & Bradley, 1981). While the reliability of diary data is difficult to assess, the literature suggests that reliable measurements can be collected when participating parents are properly trained on how to record time-use data (Anderson, Field, Collins, Pugzles Lorch, & Nathan, 1985). Previously published work suggests that coders achieved inter-rated reliability of .81 for

television content type (Vandewater, Lee, Shim, 2005)

Dosage Model

To test the hypotheses of research question 1, a longitudinal path analysis was formulated for the exogenous effects of television (in the form of hours of exposure to violent and educational television) on intermediate activities and behavior (positive behavior, internalizing/externalizing problems, reading self esteem, math self esteem, and independent reading time) and, ultimately, reading and math achievement in adolescence. Means and standard deviations for model variables can be found in Table 11.

All results discussed below have been estimated using Robust Maximum Likelihood in LISREL 8.80. The covariance matrices for these analyses can be found in Appendix E.

Prior to the interpretation of model coefficients, family context demographics of interest were added to a prior model to test hypotheses of research question 4 that examine whether family-level demographics are predictive of early television viewing behavior. To do so, a second model was fit to the data incorporating two family predictors to represent SES and the home environment: HOH years of education and the Cognitive Stimulation Subscale of the HOME Inventory. This family context model (full model) was compared to a nested model with these context pathways set to zero (model 1). Results suggest that a fully specified model including demographics results in a better fit to the data, ($\Delta\chi^2$ (10) = 133.63, $p < .05$). As expected, both parent education and cognitive environmental stimulation in the home were positively related to reading achievement. Likewise, these family context variables were also positively related to math achievement. However, no significant relationships were present between parent

education or cognitive environmental stimulation and hours of educational or violent television. It is likely that this improvement in model fit is attributable to the relationships between demographic predictors in 1997 and long-term, reading/math achievement in 2007. A path diagram displaying the significant standardized coefficients of this model can be found in Figure 2. Support for research hypothesis by family context can be found in Table 12.

The dosage model suggests that the number of hours of exposure to educational television in 1997 were not significantly associated with any of children's intermediate activities or behaviors in 2002. Exposure to hours of violent television in 1997 positively predicted internalizing behaviors and externalizing behaviors in 2002. Violent TV exposure in 1997 was also negatively associated with independent reading time in 2002.

Independent reading time and reading self-esteem in 2002 were positively associated with reading achievement in 2007. Similarly, math self esteem in 2002 was positively associated with math achievement in 2007. Externalizing behavior problems were negatively associated with reading and math achievement.

A positive association was also present from the number of hours of educational television exposure and math achievement in 2007. No significant longitudinal associations were present between hours of violent television viewing and either type of achievement in adolescence. A full table standardized and unstandardized effects for the final model can be found in Table 13.

Model Fit

Fit statistics indicate poor overall fit to the data. The Minimum Fit Function Chi-Square test with a significant p-value indicates poor fit (χ^2 (27) = 521.41, $p < .001$).

However, large sample sizes may inflate this statistic. Still, using a correction for large sample sizes (χ^2 /df = 19.31) still suggests poor fit (Wheaton, Muthen, Alwin, & Summers (1977). The Root Mean Square Error of Approximation (RMSEA) statistic .19 (90% CI = .17, .20) also indicates poor fit compared to a traditional threshold of .07 or lower as a sign of model fit (Steiger, 2007). Compared to traditional cutoff values of greater than .90, the Comparative Fit Index (CFI) of .62 also provides substantial evidence against good model fit (Bentler, 1990). It is likely that this is due to the many non-significant relationships between television variables and intermediate behavior variables.

Moderation of effects

To assess variation in these dosage effects attributable to age and gender, separate multigroup path analyses were conducted by child age and sex. To do so, dichotomous data sets were set up separating children into either male or female data or younger versus older children data respectively. Then, separate multigroup analyses compared invariant models (holding estimates equivalent across both groups) to fully variant models (allowing estimates to be freely estimated across groups). This procedure, outlined for LISREL by Jöreskog and Sörbom (1996; 2004), allows for a test of whether estimated associations are significantly different across groups. Model comparison tests reveal that fit does not improve when allowing dosage model estimates to vary by child age ($\Delta\chi 2$ (39) = 45.39, $p > .05$) or sex of the child ($\Delta\chi 2$ (39) = 43.13, $p > .05$). Overall, these effects are invariant regardless of whether children are preschool or school age or whether a child is male or female.

Mediation: a test of displacement

To test for the presence of a mediational relationship between violent TV hours, independent reading time, and reading achievement, a model setting the indirect effect of violent hours to independent reading to 0 was compared to the full model previously discussed. This allows for a test of whether the presence of an indirect relationship between violent hours and independent reading suppresses the direct non-significant relationship between violent hours and reading achievement. Results suggest that the model including the indirect effect from violent TV hours to reading time is a better fit to the data as compared to the abbreviated model with a large reduction in chi-square, providing some evidence for the presence of mediation ($\Delta\chi 2$ (1) = 125.15, p > .05). In the model with the path from violent hours to independent reading set to zero, the direct path from violent hours to reading did not become significant, thus suggesting that there is not a significant direct effect between violent television hours and reading achievement to be mediated (MacKinnon, Fairchild, and Fritz (2007). Therefore, it is appropriate to talk about the indirect effects of violent television on achievement, but this analysis does not provide evidence of a mediated effect. The total indirect effect of violent hours on reading achievement (through all pathways) is not significant (Unstandardized = -.046, *SE* = .103, *t* = -.451). The proportion of the total effect of violent hours of TV on reading achievement that is attributable to the indirect effect is 17.1 percent. A decomposition of direct, indirect and total effects for violent hours, reading time, and achievement can be found in Table 14.

In summary, the results from the dosage model suggest that hours of educational television per week in 1997 are unassociated with intermediate behavior variables in

2002. This finding is contrary to the hypotheses set forward with research question 1 predicting positive relationships between educational TV hours and 2002 behavior. However, hours of violent television exposure is negatively associated with independent reading time, providing some support for a dosage model of television's effect on achievement. Yet, the direct effects of violent hours on achievement were not significant suggesting that the influence of violent television must flow through indirect pathways.

One piece of evidence, specifically the relationship between hours of educational viewing and later math achievement, suggest that it may not simply be the number of hours of viewing that are important, but also a consideration of viewing quality.

A full report on whether evidence was found for each hypothesis of the dosage model can be found in Table 15.

Diet Model

To test the hypotheses of research question 2 for a diet model of television viewing and later achievement, a second series of longitudinal path analyses was conducted. A model was formulated to test for the exogenous effects of television, in the form of total TV exposure paired with educational and violent diet variables, the subsequent effects on intermediate behavior and, ultimately, reading and math achievement. All results discussed below have been estimated using Robust Maximum Likelihood in LISREL 8.80. Covariance matrices for these analyses can be found in Appendix E.

Prior to the interpretation of coefficients in the diet model, demographics of interest were added to the original model to test hypotheses of research question 4 (whether family demographics are predictive of early television viewing). Consistent

with findings from the dosage model, parent education and environmental stimulation were added to predict television viewing. This model was compared to a nested model with these relationships set to zero. Results suggest that a fully specified model including demographics provides a better fit to the data ($\Delta\chi^2$ (39) = 133.629, $p < .05$). The effects discussed below are those from the model including family demographics. The standardized significant effects for this model can be found in Figure 3.

Both parent education and cognitive stimulation in the home were positively related to reading achievement and math achievement.

Results suggest that children's educational TV diets (educational hours divided by total TV time) in 1997 do not predict any of the intermediate behaviors (positive or negative) in 2002. There was a marginal association between reading self-esteem and educational TV diet.

Contrary to the findings in the dosage model, violent TV diet (hours of violent TV/total TV exposure) does not predict intermediate behavior in 2002. Instead, the significant effects appear on total TV time. Total TV hours per week in 1997 negatively predicted positive behavior, internalizing problems, externalizing problems, and independent reading time in 2002.

Consistent with the findings from the dosage models, independent reading time and reading self esteem in 2002 were positively associated with reading achievement in 2007. Externalizing problems were negatively associated with reading achievement in 2007. Math self esteem was positively associated with math achievement whereas externalizing problems were negatively associated with math achievement.

Direct longitudinal effects were present from educational TV diet and reading achievement and math achievement in 2007. No significant longitudinal associations were present between violent TV diet and later achievement. A full table of effects for the final model can be found in Table 16.

Model Fit

Fit statistics indicate poor overall fit to the data for the diet model. The Minimum Fit Function Chi-Square test with a significant p-value indicates poor fit (χ^2 (27) = 534.18, $p < .001$). However, large sample sizes may inflate this statistic. Still, using a normed chi-square for large sample sizes (χ^2 /df = 18.42) still suggests poor fit (Wheaton et al., 1977). The Root Mean Square Error of Approximation (RMSEA) statistic .17 (90% CI = .15, .18) also indicates poor fit. The Comparative Fit Index of .71 also provides substantial evidence against good model fit. It is likely that this is due to the many non-significant relationships between the diet variables and the intermediate behavior variables.

Moderation of effects

To assess variation in these effects attributable to age and gender, separate multigroup path analyses of the diet model were conducted by child age and sex. Model comparison tests reveal that fit does not improve when allowing variability by child age ($\Delta\chi^2$ (49) = 68.74, $p > .05$) or sex of the child ($\Delta\chi^2$ (49) = 60.31, $p > .05$) indicating that, overall, these effects are consistent regardless of whether children are preschool or school age or male/female.

In summary, the diet model suggests that the effects of early television viewing on intermediate behavior largely flow through total number of hours spent watching TV,

further supporting a displacement hypothesis. However, the longitudinal effects of educational TV diet on reading and math achievement are consistent with previous research indicating that these long-term relationships exist even while controlling for the effects of parent education and the home environment. A full report on support for a priori hypotheses can be found in Table 17.

Longitudinal Models of Educational TV and Achievement

A separate series of longitudinal models were fit with children's achievement data that span the course of ten years (1997 to 2007). Specifically, children ages 3 to 5 were selected for this analysis to look at associations between early childhood viewing and achievement. Because different relationships were found between hours of educational television exposure and educational TV diet (proportion to total time), the longitudinal models were tested separately for both predictors to assess whether the patterns of quantity of viewing versus TV diet are different depending on the type of television variable that is used. To control for the known influences of SES on achievement, each child's income-to-needs ratio for the family was set as a control variable on each level of achievement.

Sample Selection

Only children who had a complete set of data on all three Letter-Word Recognition and Applied Problems time points are included in the models (n = 234). Passage Comprehension was not tested because it was not measured with preschool children in 1997. The only other predictor variables used in the models were proportion of educational to total TV time and the number of hours spent watching educational TV

in 1997 and income to needs ratios for each time point. Robust Maximum Likelihood was again the method of estimation.

Descriptives

All children were ages 3 to 5. Similar percentages to the previous sample were observed in this smaller group. Descriptives and frequencies for this subset can be found in Tables 18 through 20.

Data Analysis

Using the procedure outlined by Fraley, Roisman, and Holtigan (2013), a series of nested longitudinal models were used to test for the patterns of significance over time. As described previously, data sets with three or more time points allow for a deeper investigation between predictors and the outcomes as compared to longitudinal studies with two time points. The main goal of this investigation was to understand whether educational TV viewing is a significant predictor of reading and math achievement over time and whether the significance and magnitude of these relationships are maintained over time.

To conduct this analysis, a three-step process was used. First, a stability model was fit to the achievement data such that the relationship between 1997, 2002, and 2007 achievement is tested. This first model was fit to assure that age-graded assessments are stable over time. Income-to-needs ratio was included as a control variable for achievement and its stability was also tested. Simultaneously in this model, the paths from early educational TV viewing and each achievement outcome was set to 0. This allowed for subsequent testing of nested models.

Following a stability model, a revisionist effects model was fit, freeing up the

path between early TV viewing and achievement at the 1997 time point. Theoretically, this model posits that the effects of early TV viewing matter for the first time point but not for the others, which remain set to zero. This model was then tested against the stability model, via Delta Chi-Square test for model comparisons. The better fitting model was retained.

Finally, an enduring effects model was fit, freeing up the path from early TV viewing to each achievement time point. This model posits that the effects of early TV viewing are statistically significant for each time point. This model was then tested against the previous best fitting model. The best fitting model for each set of results is reported below.

Reading Achievement. Longitudinal models using educational television hours per week were fit to the longitudinal data for Letter-Word Recognition standardized scores in 1997, 2002, and 2007. Confirming hypothesis 4a, a stability model showed that early achievement scores predicted subsequent achievement scores over time, as expected, with each path reaching significance. Income-to-needs ratio was also stable over time and positively associated with achievement at each time point. Next, a revisionist model was fit to the data; a model comparison test reveals that the revisionist model was a significant improvement over the stability model ($\Delta\chi^2$ (1)= 13.17, $p < .05$) and showed a significant positive association between early educational TV viewing hours and reading achievement in 1997. Finally, an enduring effects model was fit but did not show a significant improvement in model fit over the revisionist model ($\Delta\chi^2$ (2)= 1.67, $p > .05$.) The coefficients for all three models can be found in Figure 4.

Model Fit. Fit statistics for the revisionist model of educational television dosage indicated decent fit to the data. The Minimum Fit Function Chi-Square test with a significant p-value may indicate problems with fit (χ^2 (12) = 22.87, p = .029). Using the normed chi-square correction for large sample sizes (χ^2 /df = 1.91) suggested reasonable fit. The Root Mean Square Error of Approximation (RMSEA) statistic .06 (90% CI = .02, .09) also indicated good fit. The Comparative Fit Index of .99 also provided substantial evidence to support model fit.

The above model represents the relationship between the number of hours children viewed educational programming and their achievement. As depicted in previous analyses, however, it is clear that TV diet is an important predictor for achievement and may reveal different longitudinal relationships than those captured by hours of viewing. To examine this further, the same series of models were fit using the educational TV diet variable. A stability model was fit as a baseline assessment for achievement that, again, showed consistency in the assessment of achievement. Next, a revisionist model was found to show a significant improvement in model fit over the stability model ($\Delta\chi^2$ (1)= 26.79, p < .05.) Finally, an enduring effects model was fit to the data and was found to be a significant improvement over the revisionist framework ($\Delta\chi^2$ (2)= 12.04, p < .05.) These results confirm the a priori hypothesis 4b. The estimates for these models can be found in Figure 5.

Model Fit. Fit statistics for the enduring effect model of educational TV diet indicated decent fit to the data. The Minimum Fit Function Chi-Square test with a non-significant p-value indicated a good-fitting model (χ^2 (16) = 22.58, p = .13). The Root Mean Square Error of Approximation (RMSEA) statistic .04 (90% CI = .00, .07) also

indicates good fit. The Comparative Fit Index of .99 also provides substantial evidence to support model fit.

Math Achievement. An identical procedure as described above for reading was used to model the relationship between educational TV viewing and math achievement through the use of the Applied Problems Woodcock-Johnson assessment. A stability model for hours of educational television viewing was found to support a stable measurement of math achievement (hypothesis 4a). The revisionist model was not found to be an improvement in fit ($\Delta\chi^2$ (1)= 1.2, $p > .05$.) Finally, an enduring effects model was tested against the stability model but was not found to be a significant improvement in model fit over the stability model ($\Delta\chi^2$ (3)= 4.89, $p > .05$.) Therefore, support was not found for a relationship between early educational TV viewing hours and long-term math achievement. Results of these models can be found in Figure 6.

Model Fit. Fit statistics for the stability model of educational television dosage indicate potential problems when fit to the data. The Minimum Fit Function Chi-Square test with a significant p-value may indicate problems with fit (χ^2 (13) = 32.96, $p < .01$). Using the normed chi-square for large sample sizes (χ^2 /df = 2.54) suggests a better fit. The Root Mean Square Error of Approximation (RMSEA) statistic .07 (90% CI = .038, .10) may indicate a problem in fit. The Comparative Fit Index of .98, however, provided evidence to support model fit. Therefore, in consideration of several fit statistics, the stability model was reasonable to interpret.

Analyses were also replicated to examine whether educational TV diet (proportion over total time) is related to math achievement. A stability model suggested consistency in math achievement (hypothesis 4a); when compared to this model a

revisionist model did not show evidence for a significant improvement in model fit ($\Delta\chi^2$ (2)= 11.95, $p < .05$.) Finally an enduring effects model was tested against the revisionist model; results showed support for an enduring effects model ($\Delta\chi^2$ (2)= 10.35 $p < .05$.), confirming hypothesis 4b. The estimates for these models can be found in Figure 7.

Model Fit. Fit statistics for the enduring effects model of educational TV diet indicated decent fit to the data. The Minimum Fit Function Chi-Square test with a significant p-value may indicate problems with fit (χ^2 (16) = 35.48, $p = .003$). However, as previously discussed, large sample sizes may inflate this statistic. Using a correction for large sample sizes (χ^2 /df = 2.22) suggested reasonable fit. The Root Mean Square Error of Approximation (RMSEA) statistic .06 (90% CI = .03, .09) also indicates good fit. The Comparative Fit Index of .99 indicates good fit. A full report of model comparison tests can be found in Table 21.

In sum, the results for predicting achievement from television were inconclusive when educational television is measured in terms of pure quantity. Models suggested that early number of educational hours is associated with early reading achievement with its importance declining over time. For reading achievement, educational hours were not associated with math achievement. However, for TV diet, consistent support was found for the enduring effects model of educational TV on reading and math achievement.

Longitudinal Models of Violent TV Exposure and Achievement

To examine whether the relationships described previously were specific to children's educational television diets, a similar nested models approach was used to model the longitudinal effects of violent television diets on achievement. A series of

longitudinal models (stability, revisionist, enduring effects) were used to test for relationships among children's exposure to violent television and subsequent associations with reading and math achievement.

Reading Achievement

Longitudinal models using violent television hours per week were fit to the longitudinal data for Letter-Word Recognition standardized scores in 1997, 2002, and 2007. To begin, a stability model was fit to the data. Results suggested that the longitudinal achievement scores predicted each other over time. Next, a revisionist model was fit to the data; a model comparison test revealed that the revisionist model was not a significant improvement over the stability model. Finally, an enduring effects model was fit but did not show a significant improvement. The coefficients for all three models can be found in Figure 8. Similar models were tested for violent television diet but no improvement was found beyond the stability model (results in Figure 9).

Since the stability models for the hours and diet models were the same, only one set of model fit results are presented here. Minimum Fit Function Chi-Square for the stability models (χ^2 (12)= 22.87, p = .03) and RMSEA (.056; 90% CI = 02, .09) suggest possible issues with model fit. However, the normed chi-square (1.90) and the Comparative Fit Index (CFI), a fit statistic that incorporates sample size into the equation, suggests reasonable model fit (CFI = .99). Therefore, the stability models were retained for interpretation.

Math Achievement

Longitudinal models using violent television hours per week were fit to the longitudinal data for Applied Problem standardized scores in 1997, 2002, and 2007. To

begin, a stability model was fit to the data. Results suggested that the longitudinal achievement scores predicted each other over time, as expected. Next, a revisionist model was fit to the data; a model comparison test reveals that the revisionist model was not a significant improvement over the stability model ($\Delta\chi^2$ (1)= 13.17, $p < .05$). Finally, an enduring effects model was fit but did not show a significant improvement in model fit over the stability model ($\Delta\chi^2$ (2)= 1.67, $p > .05$.) The coefficients for all three models can be found in Figure 10. A similar process was followed to model the long-term associations between violence diet and achievement but no improvement was made beyond the stability model. Parameter estimates for these models can be found in Figure 11.

Minimum Fit Function Chi-Square (χ^2 (12)= 22.87, $p = .03$) and RMSEA (.056; 90% CI = .02, .09) suggest possible issues with model fit. However, the normed chi-square (1.90) and the Comparative Fit Index (CFI), a fit statistic that incorporates sample size into the equation, suggests reasonable model fit (CFI = .99). Therefore, the stability models were retained for analysis.

In summary, support has been found for an enduring effects relationship for children's educational TV diets and long-term, enduring relationships with reading and math achievement. However, the results are inconclusive for educational hours per week. No significant, long-term relationships were found with children's violent television exposure (hours or diet) and achievement in adolescence. A full report of all model comparison tests can be found in Table 19.

Sensitivity Analysis: A Methodological Comparison

To add a methodological investigation component to this quantitative dissertation project, the results achieved utilizing Robust Maximum Likelihood (RML) were compared to those obtained using Full Maximum Likelihood (FML). Since both techniques have the same requirement, both models were fit using individuals with complete data (n = 472). Like FML, RML utilizes the traditional covariance matrix from the raw data. In addition, it utilizes an additional asymptotic covariance matrix to formulate the relationships among observed variables. It has been proposed by previous research that, unlike FML those obtained under FML, RML estimates yield unbiased standard errors under violations of multivariate normality (Yuan, Chan, & Bentler, 2000). As previously demonstrated, several of the television diary variables were severely leptokurtic and positively skewed. In an attempt to provide a type of sensitivity analysis to violations of normality, the results of the final models from each of the dosage and diet models are provided under conditions of FML and RML in Tables 20 and 21.

Differences occurred on standard error estimation across methods. The biases in standard errors that occurred under FML are unpredictable in their direction, with changes occurring in both positive and negative directions. In most cases, however, RML made the correction by widening the standard error resulting in a more conservative p-value (e.g., HOME Subscale on Total TV, Total TV on Positive Behavior, Total TV→ Internalizing Problems). In the dosage model, we see the relationship between the cognitive environment scale and educational TV hours changed from significant to non-significant under RML. We also see that a non-significant relationship between violent TV hours and independent reading time changes from non-significant to significant under RML. The marginal negative association between violent TV hours and positive

behavior trended further toward non-significance under RML. In only one case does the change appear meaningful in the diet model. In the case of educational TV diet reading self esteem, the t-value went from 1.81 to 1.88 under RML, bringing it closer to significance. In summary, the coefficients estimated under RML are identical to those obtained under FML; what differ are the standard error estimations and, subsequently, the tests for parameter significance. While changes are often slight, different standard error estimates can push marginal findings in either direction.

Table 2

Full Sample by Age and Gender (n = 472)

Age	Females	Males	Total (Percent)
3	56	63	119 (25.21%)
4	47	88	135 (28.60%)
5	44	39	83 (17.58%)
6	44	42	86 (18.22%)
7	23	22	45 (9.53%)
8	2	2	4 (1%)
Total	216 (45.76%)	256 (54.42%)	472 (100%)

Table 3

Full Sample by Age and Ethnicity (n = 472)

Ethnicity	Females (n = 216)	Males (n = 256)	Total (Percent)
White	112	133	245 (51.91%)
Black	81	98	179 (37.92%)
Hispanic	15	17	32 (6.78%)
Asian	1	3	4 (1%)
Native American	0	1	1 (< 1%)
Other	7	4	11 (2.33%)

Table 4

Child's Relationship to Head of Household in 1997 for Sample (n = 472)

	n	Percent
Child of Head (includes adopted but not stepchildren)	426	90.3%
Stepchild of Head	6	1.3%
Child of wife but not Head	4	<1%
Grandchild of Head	32	6.8%
Nephew or niece of Head	1	<1%
Other relative of Head	1	<1%
Other relative of Co-habitor	2	<1%

Table 5

Sample by US Census Regional Divisions

	n (Percent)		*n* (Percent)
New England	12 (2.5%)	*South Atlantic*	109 (23.1%)
Massachusetts	10	Delaware	0
Connecticut	1	Florida	16
Maine	0	Georgia	18
New Hampshire	0	Maryland	13
Rhode Island	1	North Carolina	28
Vermont	0	South Carolina	23
		Virginia	7
Mid-Atlantic	52 (11%)	Washington D.C.	2
New York	19	West Virginia	2
New Jersey	16		
Pennsylvania	17	*East-South Central*	51 (10.8%)
		Alabama	9
East-North Central	80 (16.9%)	Kentucky	9
Illinois	16	Mississippi	23
Indiana	9	Tennessee	10
Michigan	30		
Ohio	21	*West-South Central*	50 (10.6%)
Wisconsin	4	Arkansas	11
		Louisiana	7
West-North Central	36 (7.6%)	Oklahoma	3
Iowa	8	Texas	29
Kansas	1		
Minnesota	6	*Mountain*	14 (3%)
Missouri	14	Arizona	3
Nebraska	6	Colorado	10
North Dakota	0	Idaho	0
South Dakota	1	Montana	0
		Nevada	1
Pacific	68 (14.4%)	New Mexico	0
Alaska	0	Utah	0
California	47	Wyoming	0
Hawaii	0		
Oregon	11		
Washington	10		

Table 6

Demographics for Full Sample (*n* = 472)

	Mean	SD	Median	Min	Max
Number of Children (1997)	2.14	.95	2	1	6
Total Family Income (1997)	46,564	38,104	39,100	0	331,000
Income/Needs Ratio 1997 (*n* = 437)	3.06	2.42	2.62	0	21
Head of Household Education 1997	12.76	2.83	12.00	0	17
HOME Inventory: Subscale	10.87	2.09	11.00	2.9	14

Table 7

Sample-Included versus Sample-Excluded Subjects By Gender and Ethnicity

	Sample % (*n* = 472)	Non-Sample % (*n* = 586)
Females	45.8%	48.6%
White	51.9%	41.6%
Black	37.9%	46.6%
Hispanic	6.8%	5.5%
Asian	1%	2.6%
Native American	<1%	<1%
Other	2.3%	2.9%

Table 8

Comparisons for Sample-Included versus Sample-Excluded Subjects

	Non- sample M (SD)	Sample M (SD)	t (df)
Child Age	5.63 (1.78)	4.61 (1.34)	10.28** (1056)
Head of Household Education 97	12.60 (2.54)	12.76 (2.84)	-.950 (1010)
HOME Cognitive Stimulation 97	10.42 (2.02)	10.87 (2.09)	-3.44* (1056)
Income Needs Ratio 97	2.76 (2.94)	3.06 (2.42)	-1.72 (973)
LW Standard Score 97	101.02	100.37	.601 (914)
AP Standard Score 97	104.27 (19.64)	102.82 (17.85)	1.16 (909)
Positive Behavior Scale 02	4.09 (.61)	4.10 (.62)	-.270 (902)
Externalizing Behavior Score 02	6.59 (7.70)	5.69 (4.10)	2.21* (902)
Internalizing Behavior Score 02	4.59 (11.67)	3.32 (3.19)	2.29* (902)
Math Self Esteem 02	5.06 (.98)	5.18 (.88)	-1.81 (850)
Reading Self Esteem 02	5.23 (1.00)	5.40 (.92)	-2.58* (850)
Educational TV Hours	1.73 (2.90)	2.14 (3.13)	-2.08* (909)
Violent TV Hours	3.47 (4.84)	3.51 (4.74)	-.145 (909)
Total TV Hours	14.23 (9.82)	14.18 (9.53)	.081 (909)
Educational diet Proportion	.14 (.22)	.18 (.27)	-3.09* (909)
Violent diet Proportion	.23 (.28)	.24 (.28)	.009 (909)
Independent reading minutes	64.19 (165.02)	52.27 (122.21)	1.18 (811)

Table 9

Comparisons of Viewers and Non-viewers of Educational Television

	Educational TV	*n*	Mean (SD)
Letter-Word Recognition Standard Score	Viewers	370	101.70 (16.68)
	Non-viewers	428	99.86 (16.09)
Applied Problems Standard Score	Viewers	369	104.05 (18.70)
	Non-viewers	425	103.72 (18.91)
Income-to-Needs Ratio	Viewers	385	3.04 (2.63)
	Non-viewers	458	2.82 (2.38)
HOH Completed Education	Viewers	392	12.96 (2.66)*
	Non-viewers	482	12.49 (2.76)*
HOME – Cognitive Stimulation Scale	Viewers	409	10.89 (2.12)**
	Non-viewers	502	10.45 (2.00)**
HOME – Emotion Scale	Viewers	409	9.01 (1.82)
	Non-viewers	502	9.17 (2.00)
Total TV Minutes (Diary)	Viewers	409	940.07 (579.99)**
	Non-viewers	501	780.25 (570.46)**
Safe to Walk Around Neighborhood	Viewers	309	1.88 (.69)
	Non-viewers	365	1.88 (.69)
Number of Siblings	Viewers	400	1.15 (.89)
	Non-viewers	488	1.23 (1.25)
Child Health	Viewers	409	1.73 (.81)
	Non-viewers	499	1.69 (.81)
Number of books in the home	Viewers	408	4.67 (.71)
	Non-viewers	501	4.53 (.82)
Parental Warmth Scale	Viewers	409	4.62 (.49)
	Non-viewers	502	4.57 (.50)
Aggravation in Parenting Scale	Viewers	403	1.53 (1.03)
	Non-viewers	497	1.47 (1.04)

* $p \leq .05$; ** $p \leq .001$

(table continues)

	Educational TV	N	Mean (SD)
Parental Disagreement Scale	Viewers	244	2.00 (.60)
	Non-viewers	268	2.01 (.63)
Weekday TV Hours per Day (Parent Report)	Viewers	408	2.90 (1.88)
	Non-viewers	502	2.80 (2.21)
Weekend TV Hours per Day (Parent Report)	Viewers	409	3.60 (2.47)
	Non-viewers	501	3.78 (2.54)

* $p \leq .05$; ** $p \leq .001$

Table 10

Comparisons of Viewers and Non-viewers of Violent Television

	Violent TV	*n*	Mean (SD)
Letter-Word Recognition Standard Score	Viewers	506	100.97 (15.97)
	Non-viewers	292	100.26 (17.09)
Applied Problems Standard Score	Viewers	502	104.33 (18.27)
	Non-viewers	292	103.09 (19.69)
Income-to-Needs Ratio	Viewers	533	2.78 (2.40)
	Non-viewers	310	3.00 (2.56)
HOH Completed Education	Viewers	537	12.90 (2.57)*
	Non-viewers	337	12.40 (2.94)*
HOME – Cognitive Stimulation Scale	Viewers	565	10.71 (2.07)
	Non-viewers	346	10.54 (2.07)
HOME – Emotion Scale	Viewers	565	9.07 (1.91)
	Non-viewers	346	9.14 (1.94)
Total TV Minutes (Diary)	Viewers	565	963.85 (577.20)*
	Non-viewers	346	669.37 (537.12)*
Safe to Walk Around Neighborhood	Viewers	435	1.85 (.65)
	Non-viewers	239	1.92 (.72)
Number of Siblings	Viewers	551	1.19 (1.05)
	Non-viewers	337	1.20 (1.04)
Child Health (rated by Primary Caregiver)	Viewers	563	1.71 (.80)
	Non-viewers	345	1.71 (.82)
Number of books in the home	Viewers	564	4.61 (.75)
	Non-viewers	345	4.75 (1.39)
Parental Warmth Scale	Viewers	565	4.60 (.50)
	Non-viewers	346	4.58 (.48)
Aggravation in Parenting Scale	Viewers	558	1.55 (.99)
	Non-viewers	342	1.41 (1.09)

(table continues)

	Violent TV	*n*	Mean (SD)
Parental Disagreement Scale	Viewers	333	1.98 (.59)
	Non-Viewers	179	2.06 (.66)
Weekday TV Hours per Day (Parent Report)	Viewers	564	2.92 (1.80)
	Non-Viewers	346	2.73 (2.43)
Weekend TV Hours per Day (Parent Report)	Viewers	564	3.78 (2.35)
	Non-Viewers	346	3.56 (2.75)

* $p \leq .05$; ** $p \leq .001$

Table 11

Descriptive Statistics for Model Variables (n = 472)

	M (SD)	Median
1997 Variables		
Head of Household Education	12.76 (2.84)	12
HOME Cognitive Stimulation Scale	10.87 (2.09)	11
Total Education Hours per Week	2.15 (3.13)	.00
Total Violent Hours per Week	3.15 (4.74)	1.85
Total TV Hours per Week	14.18 (9.53)	12.21
Proportion of Educational TV Viewing	.19 (.27)	.00
Proportion of Violent TV Viewing	.24 (.28)	.15
2002 Variables		
Independent Reading Minutes	52.27 (122.21)	.00
Reading Self Esteem	5.40 (.92)	5.50
Math Self Esteem	5.18 (.88)	5.20
Positive Behavior Scale	4.10 (.624)	4.20
Internalizing Behavior Problems	3.32 (3.20)	3
Externalizing Behavior Problems	5.69 (4.10)	5
2007 Variables		
Broad Reading Achievement (LW + PC)	200.01 (29.69)	196
Math Achievement (AP)	102.76 (15.48)	101

Table 12

Summarized Evidence For/Against A Priori Family Context Hypotheses

Hypothesis	Evidence for Hypothesis	No Evidence for Hypothesis
3a. A model adding demographic predictors (parent education and the home environment) will show a significant improvement in model fit over the non-demographic dosage model.	Support for hypothesis.	
3b. A model adding demographic predictors (parent education and the home environment) will show a significant improvement in model fit over the non-demographic diet model.	Support for hypothesis.	
3c. Parent education and the Cognitive Stimulation Scale from the HOME Inventory will negatively predict total time spent with television (diet model).	Yes for HOME	No for parent education
3d. Parent education and the Cognitive Stimulation Scale from the HOME Inventory will positively predict time spent with educational television and educational TV diet.	Yes for HOME on ed diet	No for Parent education on ed hours or ed diet; no for HOME on ed hours
3e. Parent education and the Cognitive Stimulation Scale from the HOME Inventory will negatively predict time spent with violent television and violent TV diet.		No support for hypothesis.
3f. Results from hypotheses 1a through 1f will not be different by child age in 1997 (older versus younger).	Support for hypothesis	
3g. Results from hypotheses 1a through 1f may differ by gender, particularly through the violence diet variables, such that girls have higher levels of externalizing behaviors in 2002 as a result of violent TV diet.	Trending support for hypothesis	

Table 13

Dosage Model Results – Standardized and Unstandardized

	Standardized	Unstandardized	SE	t-value
Effects on TV				
Parent Ed→ Ed Hrs.	.03	.04	.05	.72
HOME →Ed Hrs.	.11	.16	.09	1.90
Parent Ed →Violent Hrs.	.01	.02	.09	.19
HOME→Violent Hrs.	-.04	-.08	.11	-.75
Effects on Behavior				
Ed Hrs.→Ind. Reading	.02	.63	1.74	.36
Violent Hrs. →Ind. Reading	-.07	-1.77	.79	-2.23
Ed Hrs. →Positive Behavior	-.01	.001	.009	-.11
Violent Hrs→Positive Behavior	-.09	-.01	.008	-1.52
Ed Hrs.→Ext. Problems	.03	.04	.05	.77
Violent Hrs. →Ext. Problems	**.10**	**.08**	**.04**	**2.02**
Ed Hrs. →Int. Problems	.06	.07	.05	1.36
VioHrs→Int. Problems	**.11**	**.08**	**.04**	**2.10**
EdHrs→Math Self Esteem	-.06	-.02	.01	-1.26
VioHrs→Math Self Esteem	.07	.003	.008	.42
EdHrs→Read Self Esteem	.03	.02	.01	1.26
VioHrs→Read Self Esteem	-.04	.01	.008	1.62
IndRead→Read Self Esteem	.08	.006	.0004	1.50
Effects on Achievement				
Ed Hrs.→Read Achieve	.03	.28	.38	.75
Violent Hrs.→ Read Achieve	-.04	-.23	.26	-.89
Ind. Reading→ Read Achieve	**.11**	**.03**	**.01**	**2.17**
Positive Behavior→ Read Achieve	-.05	-2.12	2.06	-1.03
Ext. Problems→ Read Achieve	**-.14**	**-.96**	**.29**	**-3.31**
Int. Problems→ Read Achieve	-.03	-.27	.37	-.72
Math Self Esteem→ Read Achieve	.03	1.07	1.41	.75
Read Self Esteem→ Read Achieve	**.20**	**6.32**	**1.34**	**4.72**
Parent Ed→ Read Achieve	**.23**	**2.34**	**.47**	**4.97**
HOME→ Math Achieve	**.23**	**3.35**	**.71**	**4.71**
Ed Hrs.→ Math Achieve	**.08**	**.40**	**.19**	**2.04**
Violent Hrs.→ Math Achieve	-.02	-.07	.12	-.57
Ind. Reading→ Math Achieve	.06	.008	.007	1.02
Positive Behavior→ Math Achieve	-.06	1.50	.95	-1.58

(table continues)

	Standardized	Unstandardized	SE	t-value
Ext. Problems→ Math Achieve	**-.12**	**-.46**	**.12**	**-3.73**
Int. Problems→ Math Achieve	-.01	.04	.18	-.25
Math Self Esteem→ Math Achieve	**.29**	**5.02**	**.72**	**7.00**
Read Self Esteem→ Math Achieve	-.05	-.84	.69	-1.22
Parent Ed→ Math Achieve	**.22**	**1.21**	**.25**	**4.86**
HOME→ Math Achieve	**.23**	**1.69**	**.34**	**4.96**

Table 14

Decomposition of Effects of Violent Hours on Achievement

	Violent TV Hours		
Endogenous variables	Unstandardized	*SE*	Standardized
Independent			
Reading			
Direct effect	-1.77*	.79	-.07
Indirect effect	--	--	--
Total effect	-1.77*	.79	-.07
Reading achievement			
Direct effect	-.232	.375	-.038
Indirect effect	-0.046	.103	-0.008
Total effect	-0.279	0.270	-0.045

* $p < .05$

Table 15

Summarized Evidence For/Against A Priori Dosage Model Hypotheses

Hypothesis	**Evidence for Hypothesis**	**No Evidence for Hypothesis**
1a. Total time spent reading in 2002 will positively predict reading self esteem in 2002 and reading achievement in 2007.	Yes for reading self esteem	No for reading achievement
1b. Reading self esteem and positive behavior in 2002 will positively predict reading achievement in 2007.	Yes for reading achievement	No for positive behavior
1c. Math self esteem and positive behavior in 2002 will positively predict math achievement in 2007.	Yes for math achievement	No for positive behavior
1d. Internalizing and externalizing behavior problems in 2002 will negatively predict reading and math achievement in 2007.	Yes for externalizing behavior	No for internalizing behavior
1e. Number of hours of educational TV viewing in 1997 will positively predict independent reading, reading self esteem, math self esteem, and prosocial behavior in 2002.		No evidence to support hypothesis
1f. Number of hours of educational TV viewing in 1997 will be negatively associated with internalizing and externalizing behavior problems in 2002.		No evidence to support hypothesis
1g. Number of hours of educational TV viewing in 1997 will be positively associated with reading and math achievement in 2007.	Yes for math achievement	No for reading achievement
1h. Number of hours of violent TV viewing in 1997 will negatively predict independent reading, reading self esteem, math self esteem, and prosocial behavior in 2002.		No evidence to support hypothesis
1i. Number of hours of violent TV viewing in 1997 will positively internalizing and externalizing behavior problems in 2002.	Yes for both internalizing and externalizing behavior	
1j. Number of hours of violent TV viewing in 1997 will be negatively associated with reading and math achievement in 2007.		No evidence to support hypothesis

Table 16

Diet Model Results - Standardized and Unstandardized

	Standardized	Unstandardized	SE	t-value
Effects on TV				
Parent Ed→Total TV	-.09	-.31	.17	-1.81
HOME→Total TV	**-.16**	**-.75**	**.25**	**-3.01**
Parent Ed→Ed Diet	.01	.001	.005	.28
HOME→Ed Diet	**.19**	**.02**	**.006**	**3.55**
Parent Ed→Violent Diet	**.10**	**.01**	**.005**	**2.24**
HOME→Violent Diet	.07	.009	.007	1.68
Effects on Behavior				
Total TV→Ind. Reading	**-.11**	**-1.46**	**.60**	**-2.42**
Ed Diet→Ind. Reading	.05	22.88	24.59	.93
Violent Diet→Ind. Reading	.06	25.59	24.41	1.05
Total TV→Positive Behavior	**-.15**	**-.01**	**.004**	**-2.54**
Ed Diet→Positive Behavior	.004	.009	.09	.10
Violent Diet→Positive Behavior	.06	.04	.10	.35
Total TV→Ext. Problems	**.10**	**.04**	**.02**	**2.26**
Ed Diet→Ext. Problems	.03	.43	.64	.67
Violent Diet→Ext. Problems	.04	.53	.67	.80
Total TV→Int. Problems	**.11**	**.04**	**.02**	**2.21**
Ed Diet→Int. Problems	.04	.45	.50	.90
Violent Diet→Int. Problems	.07	.79	.52	1.52
Total TV→Math Self Esteem	-.06	-.005	.004	-1.22
Ed Diet→Math Self Esteem	-.02	-.06	.15	-.40
Violent Diet→Math Self Esteem	.01	.03	.15	.23
Total TV→Read Self Esteem	.04	.004	.005	.86
Ed Diet→Read Self Esteem	.08	.28	.15	1.88
Violent Diet→Read Self Esteem	.06	.19	.15	1.25
Ind. Reading→Read Self Esteem	.07	.0006	.0004	1.38

(table continues)

	Standardized	Unstandardized	SE	t-value
Effects on Achievement				
Total TV→Read Achieve	-.07	-.21	.12	-1.70
Ed Diet→ Read Achieve	**.09**	**9.57**	**4.07**	**2.35**
Violent Diet→ Read Achieve	-.02	-1.59	4.36	-.37
Ind. Reading→ Read Achieve	**.11**	**.03**	**.01**	**2.14**
Positive Behavior→ Read Achieve	-.05	2.48	2.01	-1.22
Ext. Problems→ Read Achieve	**-.14**	**-1.01**	**.29**	**-3.50**
Int. Problems→ Read Achieve	-.03	-.23	.37	-.62
Math Self Esteem→ Read Achieve	.03	.92	1.42	.65
Read Self Esteem→ Read Achieve	**.20**	**6.28**	**1.33**	**4.72**
Parent Ed→ Read Achieve	**.22**	**2.30**	**.47**	**4.88**
HOME→ Read Achieve	**.22**	**3.04**	**.73**	**4.19**
Total TV→ Math Achieve	-.07	-.11	.06	-1.86
Ed Diet→ Math Achieve	**.11**	**6.47**	**2.12**	**3.05**
Violent Diet→ Math Achieve	.03	1.59	2.33	.68
Ind. Reading→ Math Achieve	.05	.006	.007	.87
Positive Behavior→ Math Achieve	-.07	-1.76	.92	-1.90
Ext. Problems→ Math Achieve	**-.13**	**-.49**	**.12**	**-4.01**
Int. Problems→ Math Achieve	-.004	-.02	.17	-.11
Math Self Esteem→ Math Achieve	**.28**	**4.90**	**.72**	**6.85**
Read Self Esteem→ Math Achieve	-.05	-.84	.68	-1.24
Parent Ed→ Math Achieve	**.21**	**1.17**	**.25**	**4.75**
HOME→ Math Achieve	**.20**	**1.51**	**.33**	**4.37**

Table 17

Summarized Evidence For/Against A Priori Diet Model Hypotheses

Hypothesis	Evidence for Hypothesis	No Evidence for Hypothesis
2a. Total time spent reading in 2002 will positively predict reading self esteem in 2002 and reading achievement in 2007.	Yes for reading achievement	No for reading self esteem
2b. Reading self esteem and positive behavior in 2002 will positively predict reading achievement in 2007.	Yes for reading self esteem	No for positive behavior
2c. Math self esteem and positive behavior in 2002 will positively predict math achievement in 2007.	Yes for math self esteem	No for positive behavior
2d. Internalizing and externalizing behavior problems in 2002 will negatively predict reading and math achievement in 2007.	Yes for externalizing problems on both	No for internalizing problems on both
2e. Total number of TV hours per week in 2002 will positively predict internalizing and externalizing problems in 2007.	Yes for both	
2f. Total number of TV hours per week in 2002 will negatively predict independent reading time in 2002, positive behavior, and reading/math self esteem.	Yes for independent reading and positive behavior	No for math or reading self esteem
2g. Educational TV diet 1997 will positively predict independent reading, reading self esteem, math self esteem, and prosocial behavior in 2002.		No support for hypothesis
2h. Educational TV diet 1997 will be negatively associated with internalizing and externalizing behavior problems in 2002.		No support for hypothesis

(table continues)

Hypothesis	Evidence for Hypothesis	No Evidence for Hypothesis
2i. Educational TV diet in 1997 will be positively associated with reading and math achievement in 2007.	Yes for both	
2j. Violent TV diet in 1997 will negatively predict independent reading, reading self esteem, math self esteem, and prosocial behavior in 2002.		No support for hypothesis
2k. Violent TV diet in 1997 will positively internalizing and externalizing behavior problems in 2002.		No support for hypothesis
2l. Violent TV diet in 1997 will be negatively associated with reading and math achievement in 2007.		No support for hypothesis

Table 18

Longitudinal Sample by Age and Gender (n = 324)

Age	Females	Males	Total (Percent)
3	55	59	114 (35.2%)
4	43	88	131 (40.4%)
5	39	40	79 (24.4%)
Total	137 (42.3%)	187 (57.7%)	324 (100%)

Table 19

Longitudinal Sample by Age and Ethnicity (n = 324)

Ethnicity	Females (n = 137)	Males (n = 187)	Total n (Percent)
White	71	104	175 (54%)
Black	59	76	135 (41.7%)
Hispanic	2	3	5 (1.5%)
Other	5	4	9 (2.8%)

Table 20

Longitudinal Sample by US Census Regional Divisions

	n (Percent)		*n* (Percent)
New England	9 (2.8%)	South Atlantic	88 (27.2%)
Mid-Atlantic	35 (10.8%)	East-South Central	43 (13.3%)
East-North Central	49 (15.1%)	West-South Central	37 (11.4%)
West-North Central	21 (6.5%)	Mountain	10 (3.1%)
Pacific	32 (9.9%)		

Table 21

Demographics for Longitudinal Sample (*n* = 324)

	Mean	SD	Median	Min	Max
Number of Children (1997)	2.09	.98	2	1	8
Total Family Income (1997)	46,024	37429	38751	0	254,000
Income/Needs Ratio 1997	2.94	2.32	2.45	0	13.57
Head of Household Education 1997 (n = 309)	13.13	2.29	12	5	17
HOME Inventory: Subscale	11.12	2.11	11.7	2.9	14

Table 22

Dosage Model Results by Estimation Method (Unstandardized)

	Full Maximum Likelihood			Robust Maximum Likelihood		
	Coeff	SE	t-value	Coeff	SE	t-value
Parent Ed→ Ed Hrs.	.04	.06	.65	.04	.05	.72
HOME →Ed Hrs.	**.16**	**.08**	**2.17**	.16	.09	1.90
Parent Ed →Violent Hrs.	.02	.08	.20	.02	.09	.19
HOME→Violent Hrs.	-.08	.11	-.73	-.08	.11	-.75
Ed Hrs.→Ind. Reading	.63	1.80	.35	.63	1.74	.36
Violent Hrs. →Ind. Reading	-1.77	1.19	-1.49	**-1.77**	**.79**	**-2.23**
Ed Hrs. →Positive Behavior	.001	.009	-.11	.001	.009	-.11
Violent Hrs→Positive Behavior	-.01	.006	-1.94	-.01	.008	-1.52
Ed Hrs.→Ext. Problems	.04	.06	.71	.04	.05	.77
Violent Hrs. →Ext. Problems	**.08**	**.04**	**2.11**	**.08**	**.04**	**2.02**
Ed Hrs. →Int. Problems	.07	.05	1.41	.07	.05	1.36
VioHrs→Int. Problems	**.08**	**.03**	**2.45**	**.08**	**.04**	**2.10**
EdHrs→Math Self Esteem	-.02	.01	-1.26	-.02	.01	1.26
VioHrs→Math Self Esteem	.003	.009	.39	.003	.008	.42
EdHrs→Read Self Esteem	.02	.01	1.25	.02	.01	1.26
VioHrs→Read Self Esteem	.01	.009	1.43	.01	.008	1.62
IndRead→Read Self Esteem	.006	.0003	1.79	.0006	.0004	1.50
Ed Hrs.→Read Achieve	.28	.38	.74	.28	.38	.75
Violent Hrs.→ Read Achieve	-.23	.25	-.92	-.23	.26	-.89
Ind. Reading→ Read Achieve	**.03**	**.009**	**2.76**	**.03**	**.01**	**2.17**
Positive Behavior→ Read Achieve	-2.12	1.89	-1.12	-2.12	2.06	-1.03
Ext. Problems→ Read Achieve	**-.96**	**.29**	**-3.36**	**-.96**	**.29**	**-3.31**
Int. Problems→ Read Achieve	-.27	.37	-.72	-.27	.37	-.72
Math Self Esteem→ Read Achieve	1.07	1.34	.80	1.07	1.41	.75
Read Self Esteem→ Read Achieve	**6.32**	**1.29**	**4.92**	**6.32**	**1.34**	**4.72**
Parent Ed→ Read Achieve	**2.34**	**.45**	**5.17**	**2.34**	**.47**	**4.97**

(table continues)

	Full Maximum Likelihood			Robust Maximum Likelihood		
HOME→ Math Achieve	**3.35**	**.62**	**5.41**	**3.35**	**.71**	**4.71**
Ed Hrs.→ Math Achieve	**.40**	**.20**	**2.00**	**.40**	**.19**	**2.04**
Violent Hrs.→ Math Achieve	-.07	.13	-.51	-.07	.12	-.57
Ind. Reading→ Math Achieve	.008	.005	1.50	.008	.007	1.02
Positive Behavior→ Math Achieve	1.50	.99	-1.52	1.50	.95	-1.58
Ext. Problems→ Math Achieve	**-.46**	**.15**	**-3.05**	**-.46**	**.12**	**-3.73**
Int. Problems→ Math Achieve	.04	.19	-.23	.04	.18	-.25
Math Self Esteem→ Math Achieve	**5.02**	**.70**	**7.16**	**5.02**	**.72**	**7.00**
Read Self Esteem→ Math Achieve	-.84	.67	-1.25	-.84	.69	-1.22
Parent Ed→ Math Achieve	**1.21**	**.24**	**5.09**	**1.21**	**.25**	**4.86**
HOME→ Math Achieve	**1.69**	**.32**	**5.21**	**1.69**	**.34**	**4.96**

Table 23

Diet Model Results by Estimation Method (Unstandardized)

	Full Maximum Likelihood			Robust Maximum Likelihood		
	Coeff	SE	t-value	Coeff	SE	t-value
Parent Ed→Total TV	-.31	.17	-1.87	-.31	.17	-1.81
HOME→Total TV	**-.75**	**.23**	**-3.31**	**-.75**	**.25**	**-3.01**
Parent Ed→Ed Diet	.001	.005	.27	.001	.005	.28
HOME→Ed Diet	**.02**	**.006**	**3.80**	**.02**	**.007**	**3.55**
Parent Ed→Violent Diet	**.01**	**.005**	**1.99**	**.01**	**.004**	**2.24**
HOME→Violent Diet	.009	.007	1.38	.009	.005	1.68
Total TV→Ind Reading	**-1.46**	**.59**	**-2.49**	**-1.46**	**.60**	**-2.42**
Ed Diet→Ind. Reading	22.88	20.76	1.10	22.88	24.59	.93
Violent Diet→Ind Reading	25.59	20.26	1.26	25.59	24.41	1.05
Total TV→Positive Behavior	**-.01**	**.003**	**-3.29**	**-.01**	**.004**	**-2.54**
Ed Diet→Positive Behavior	.009	.11	.09	.009	.09	.10
Violent Diet →Positive Behavior	.04	.10	.34	.04	.10	.35
Total TV→Ext. Problems	**.04**	**.02**	**2.24**	**.04**	**.02**	**2.26**
Ed Diet→Ext. Problems	.43	.70	.62	.43	.64	.67
Violent Diet→Ext. Problems	.53	.68	.78	.53	.67	.80
Total TV→Int. Problems	**.04**	**.02**	**2.44**	**.04**	**.02**	**2.21**
Ed Diet→Int. Problems	.45	.54	.83	.45	.50	.90
Violent Diet→Int. Problems	.79	.53	1.49	.79	.52	1.52
Total TV→Math Self Esteem	-.005	.004	-1.19	-.005	.004	-1.22
Ed Diet→Math Self Esteem	-.06	.15	-.41	-.06	.15	-.40
Violent Diet→Math Self Esteem	.03	.15	.23	.03	.15	.23
Ind. Reading→Math Self Esteem	.0001	.0003	-.06	.0001	.0003	-.06
Total TV→Read Self Esteem	.004	.004	.96	.004	.005	.86
Ed Diet→Read Self Esteem	.28	.16	1.81	.28	.15	1.88
Violent Diet→Read Self Esteem	.19	.15	1.26	.19	.15	1.25
Ind. Reading→Read Self Esteem	.0006	.0003	1.65	.0006	.0004	1.38

(table continues)

	Full Maximum Likelihood			Robust Maximum Likelihood		
Violent Diet→Read Self Esteem	.19	.15	1.26	.19	.15	1.25
Ind. Reading→Read Self Esteem	.0006	.0003	1.65	.0006	.0004	1.38
Total TV→Read Achieve	-.21	.13	-1.61	-.21	.12	-1.70
Ed Diet→ Read Achieve	**9.57**	**4.43**	**2.16**	**9.57**	**4.07**	**2.35**
Violent Diet→ Read Achieve	-1.59	4.28	-.37	-1.59	4.36	-.37
Ind. Reading→ Read Achieve	**.03**	**.01**	**2.61**	**.03**	**.01**	**2.14**
Positive Behavior→ Read Achieve	2.48	1.89	-1.31	2.48	2.01	-1.22
Ext. Problems→ Read Achieve	**-1.01**	**.29**	**-3.54**	**-1.01**	**.29**	**-3.50**
Int. Problems→ Read Achieve	-.23	.37	-.63	-.23	.37	-.62
Math Self Esteem→ Read Achieve	.92	1.33	.69	.92	1.42	.65
Read Self Esteem→ Read Achieve	**6.28**	**1.28**	**4.91**	**6.28**	**1.33**	**4.72**
Parent Ed→ Read Achieve	**2.30**	**.45**	**5.07**	**2.30**	**.47**	**4.88**
HOME → Read Achieve	**3.04**	**.63**	**4.84**	**3.04**	**.73**	**4.19**
Total TV→ Math Achieve	-.11	.07	-1.64	-.11	.06	-1.86
Ed Diet→ Math Achieve	**6.47**	**2.32**	**2.79**	**6.47**	**2.12**	**3.05**
Violent Diet→ Math Achieve	1.59	2.23	.71	1.59	2.33	.68
Ind. Reading→ Math Achieve	.006	.005	1.25	-.31	.007	.87
Positive Behavior→ Math Achieve	-1.76	.99	-1.78	-.75	.92	-1.90
Ext. Problems→ Math Achieve	**-.49**	**.15**	**-3.26**	**.001**	**.12**	**-4.01**
Int. Problems→ Math Achieve	-.02	.19	-.10	**.02**	.17	-.11
Math Self Esteem→ Math Achieve	**4.90**	**.70**	**7.04**	**.01**	**.72**	**6.85**
Read Self Esteem→ Math07	-.84	.67	-1.26	.009	.68	-1.24
Parent Ed→ Math Achieve	**1.17**	**.24**	**4.93**	**-1.46**	**.25**	**4.75**
HOME→ Math Achieve	**1.51**	**.33**	**4.58**	22.88	**.35**	**4.37**

Table 24

Model Comparison Tests: Longitudinal Models

	Minimum Fit χ^2	df	$\Delta\chi^2$	Δdf
Reading – Ed Hours				
Stability	32.96	13		
Revisionist	22.87	12	10.09*	1
Enduring Effects	21.20	10	1.67	2
Reading – Ed Diet				
Stability	57.78	20		
Revisionist	34.62	18	23.16*	2
Enduring Effects	22.58	16	12.04*	2
Math – Ed Hours				
Stability	32.96	13		
Revisionist	31.76	12	1.2	1
Enduring Effects	28.07	10	4.89	3
Math – Ed Diet				
Stability	57.78	20		
Revisionist	45.83	18	11.95*	2
Enduring Effects	35.48	16	10.35*	2
Reading – Vio Hours				
Stability	22.22	13		
Revisionist	21.10	12	1.12	1
Enduring Effects	16.75	10	5.47	3
Reading – Vio Diet				
Stability	32.67	20		
Revisionist	30.89	18	1.78	2
Enduring Effects	29.50	16	3.17	4
Math – Vio Hours				
Stability	28.34	13		
Revisionist	28.22	12	.12	1
Enduring Effects	23.51	10	4.83	3
Math – Vio Diet				
Stability	46.73	20		
Revisionist	46.70	18	.03	2
Enduring Effects	41.02	16	5.71	4

Figure 1. Television Diet Variables from Full Sample with Diary Data (n = 1058)

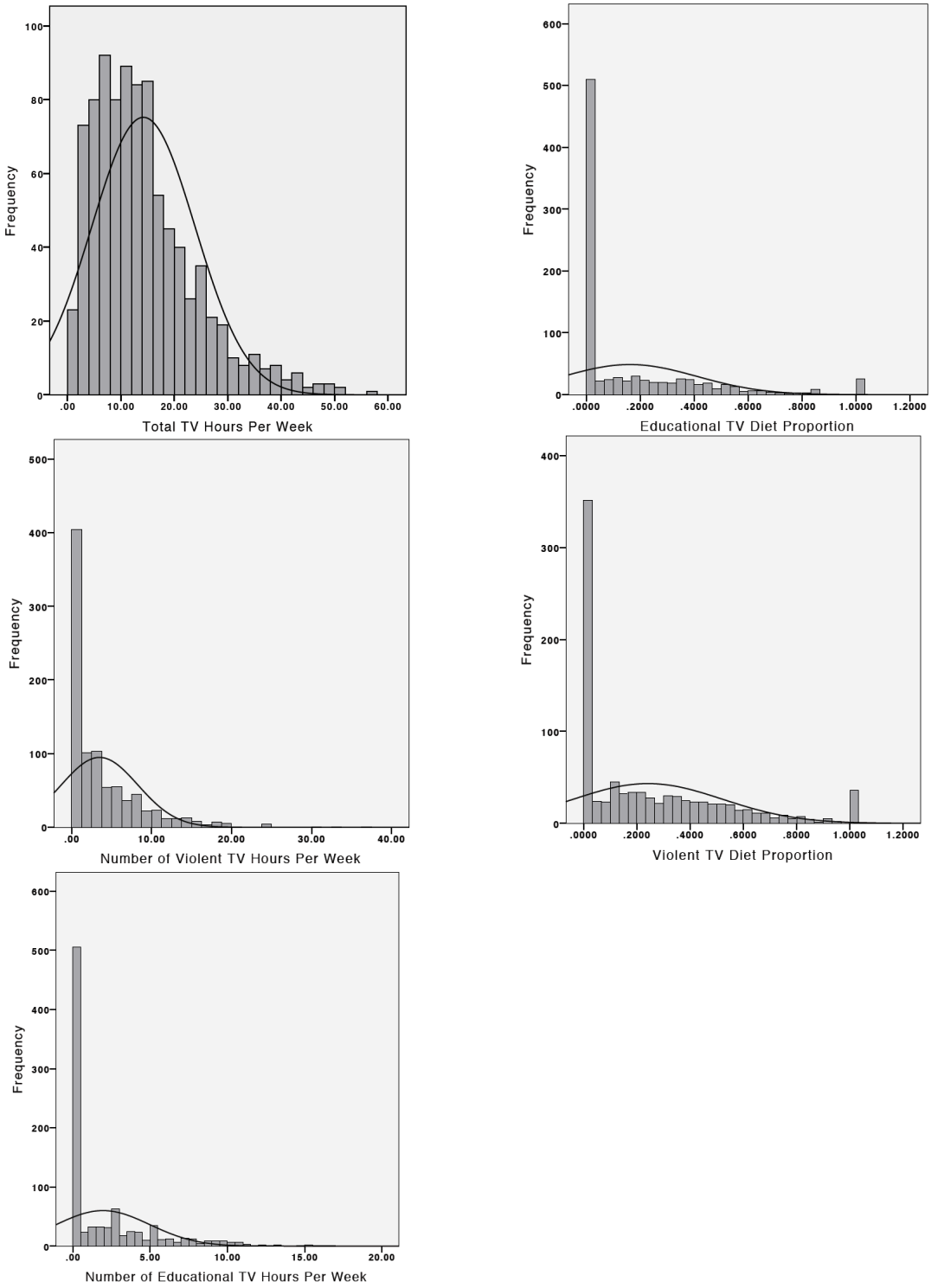
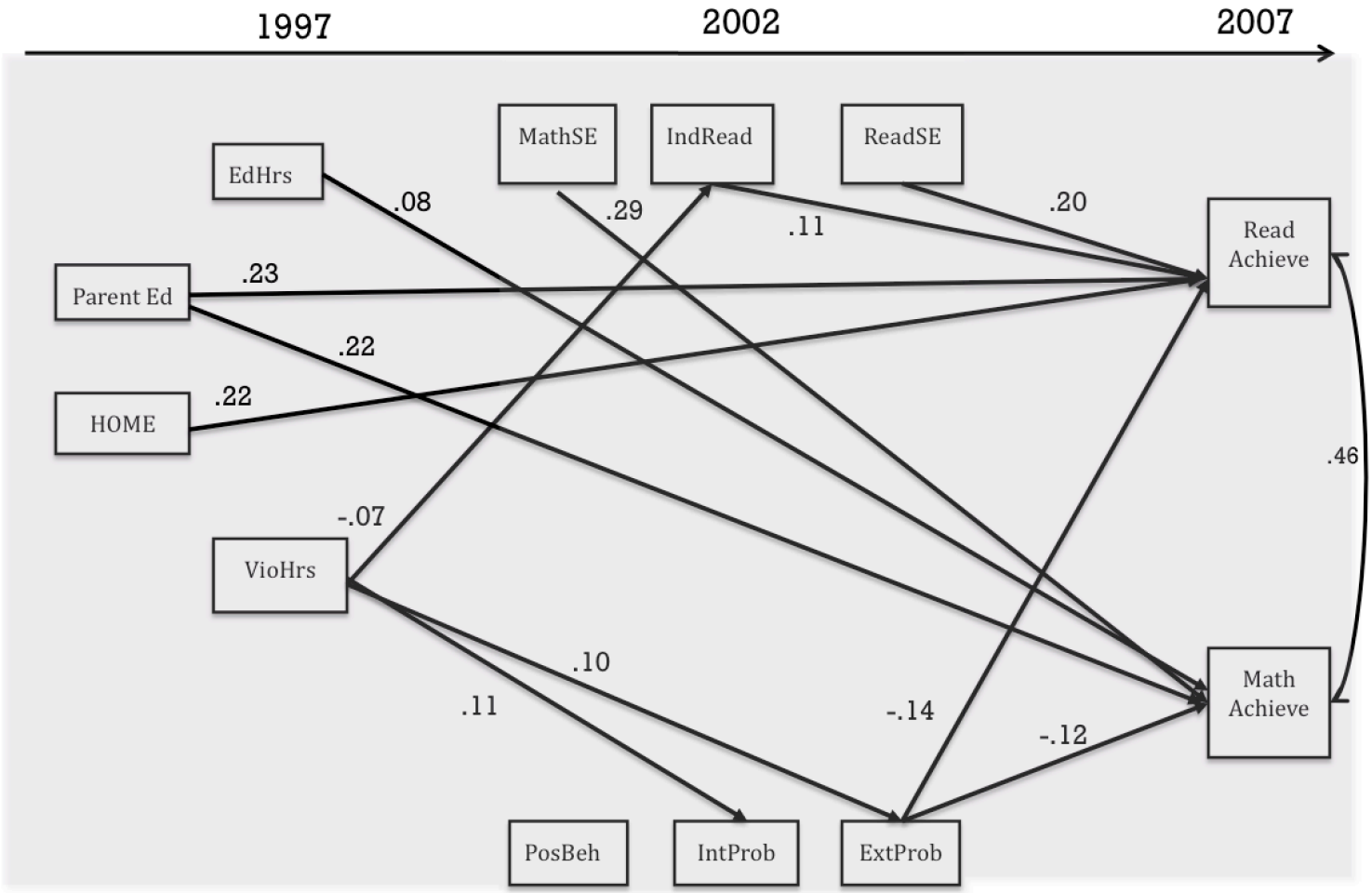
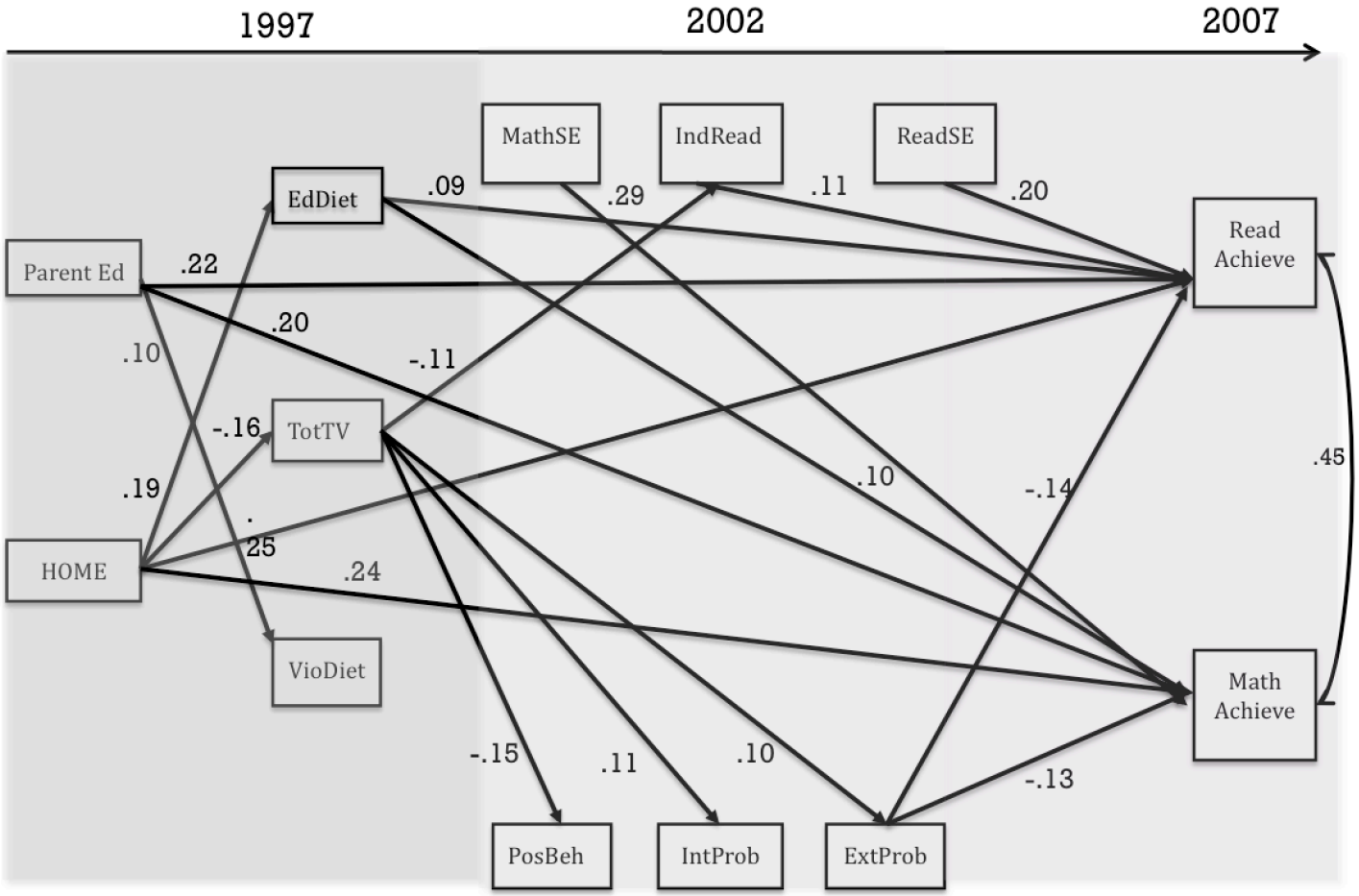


Figure 2. Dosage Model of Television Viewing on Achievement



Note: All model estimates presented are standardized. Abbreviations: HOME =HOME Inventory; EdHrs= educational TV hours; VioHrs = violent TV hours; MATHSE = Math Self Esteem; ReadSE = Reading Self Esteem; IndRead = Independent Reading; IntProb = Internalizing behavior; ExtProb = Externalizing behavior

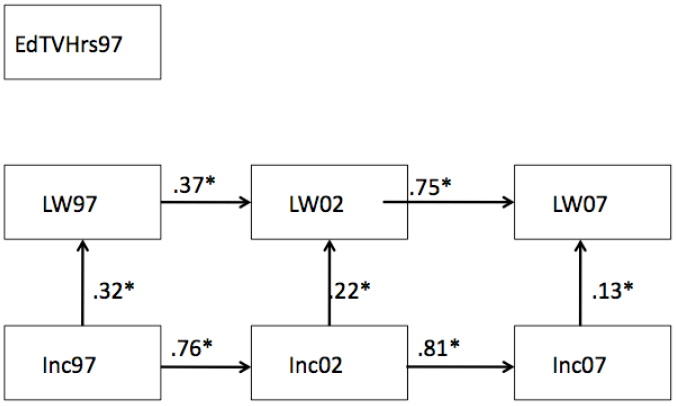
Figure 3. Diet Model of Television Viewing on Achievement



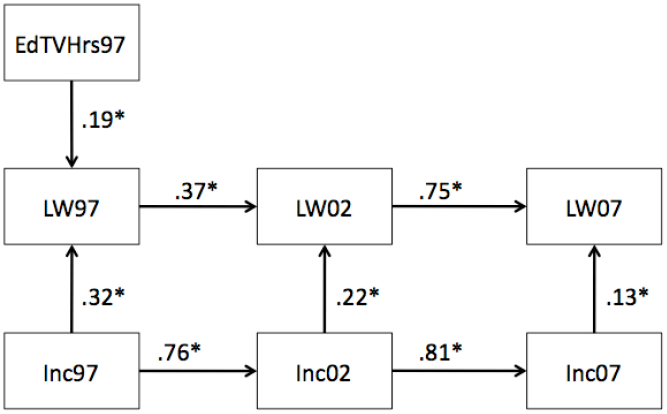
Note: All model estimates presented are standardized. Abbreviations: HOME =HOME Inventory; EdHrs= educational TV hours; VioHrs = violent TV hours; MATHSE = Math Self Esteem; ReadSE = Reading Self Esteem; IndRead = Independent Reading; IntProb = Internalizing behavior; ExtProb = Externalizing behavior

Figure 4. Reading Models for Educational Hours per Week

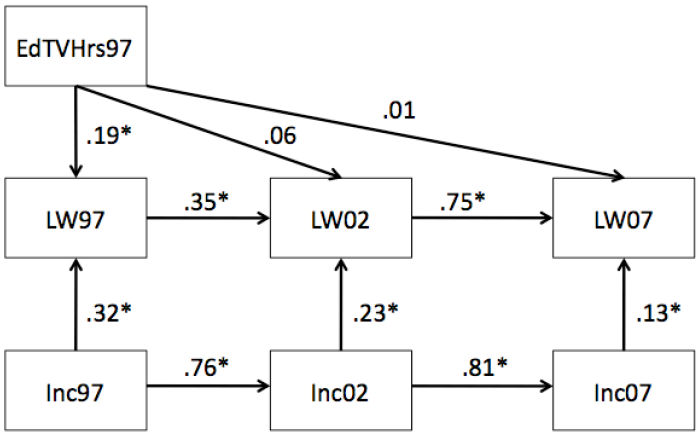
Model A: Stability Model



Model B: Revisionist Model



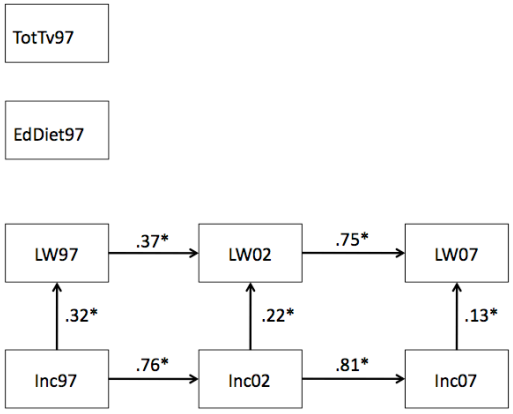
Model C: Enduring Effects Model



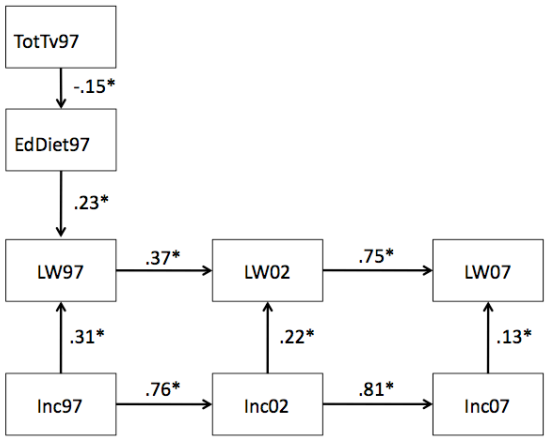
Note: All model estimates presented are standardized. Abbreviations: EdTVHrs = educational TV hours; LW = Letter-Word Identification; Inc = Income-to-Needs Ratio

Figure 5. Reading Models for Educational TV Diet

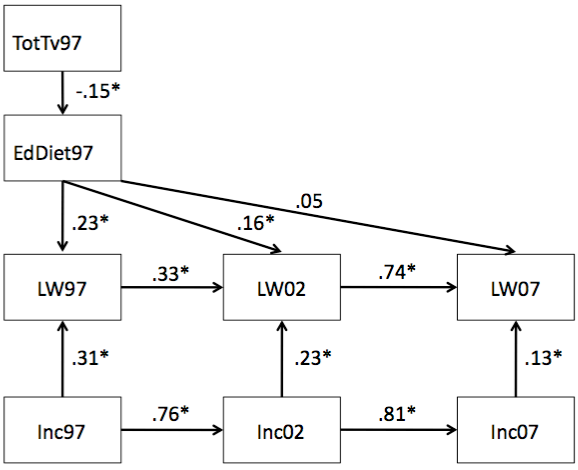
Model A: Stability Model



Model B: Revisionist Model



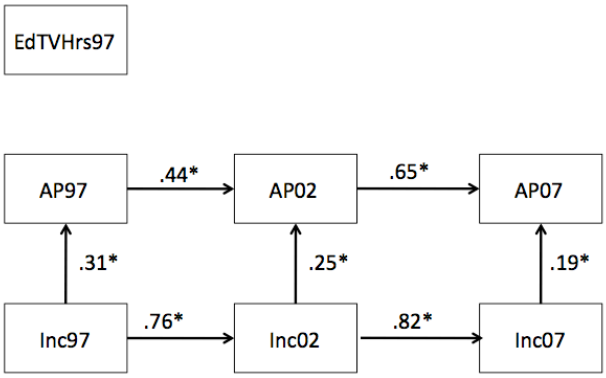
Model C: Enduring Effects Model



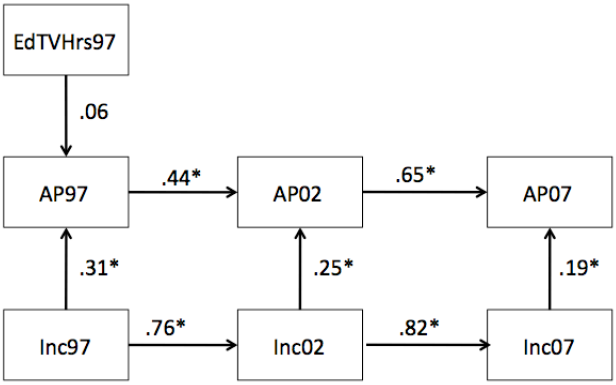
Note: All model estimates presented are standardized. Abbreviations: TotTV = Total TV time; EdDiet = Educational TV diet; LW = Letter-Word Identification; Inc = Income-to-Needs Ratio

Figure 6. Math Models for Educational Hours per Week

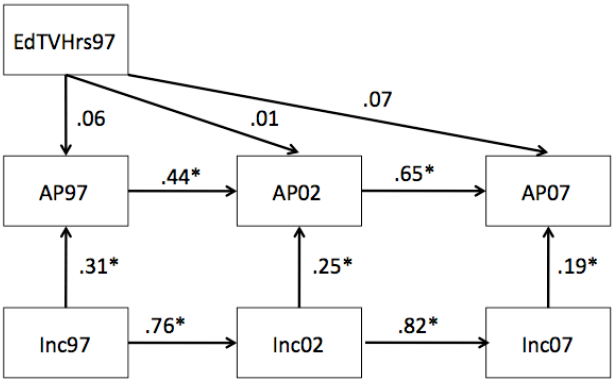
Model A: Stability Model



Model B: Revisionist Model



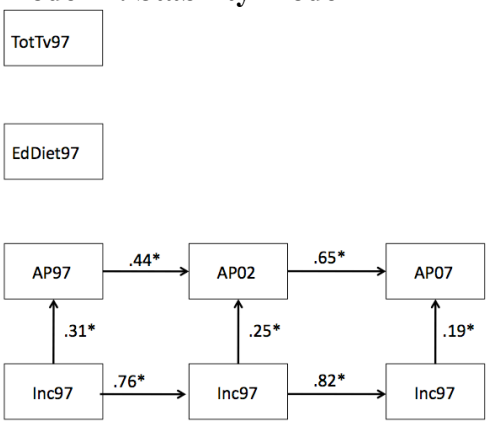
Model C: Enduring Effects Model



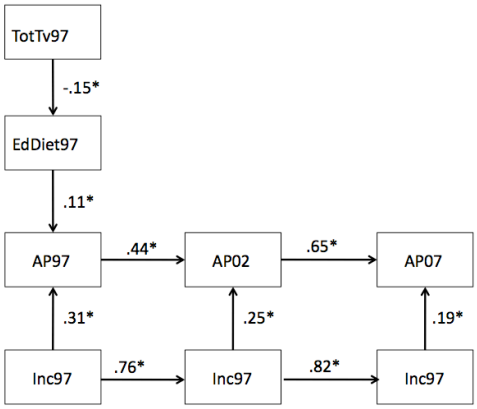
Note: All model estimates presented are standardized. Abbreviations: EdTVHrs = educational TV hours; AP = Applied Problems; Inc = Income-to-Needs Ratio

Figure 7. Math Models for Educational TV Diet

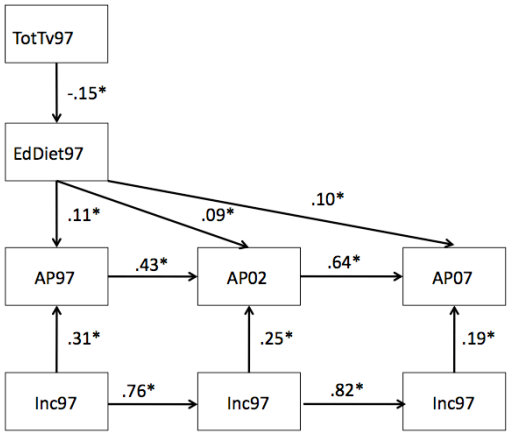
Model A: Stability Model



Model B: Revisionist Model



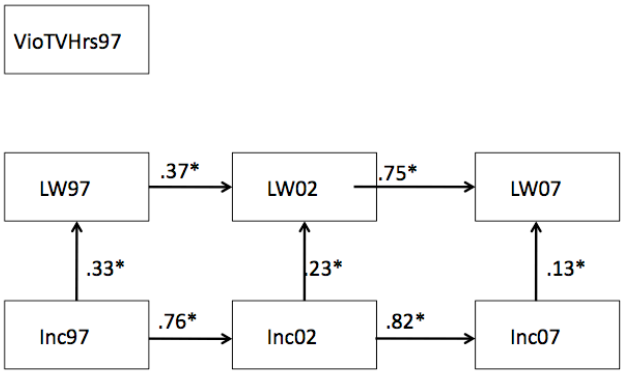
Model C: Enduring Effects Model



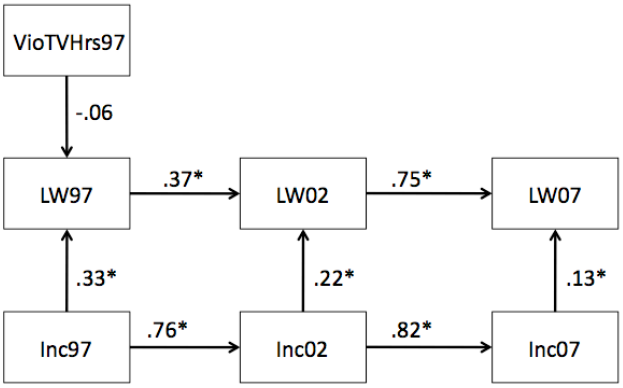
Note: All model estimates presented are standardized. Abbreviations: TotTV = Total TV time; EdDiet = Educational TV diet; AP =Applied Problems; Inc = Income-to-Needs Ratio

Figure 8. Reading Models for Violent Hours per Week

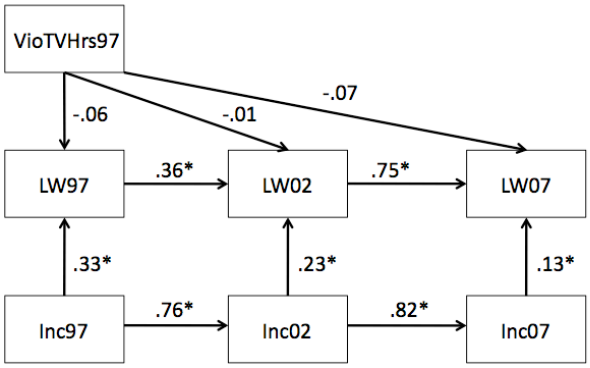
Model A: Stability Model



Model B: Revisionist Model



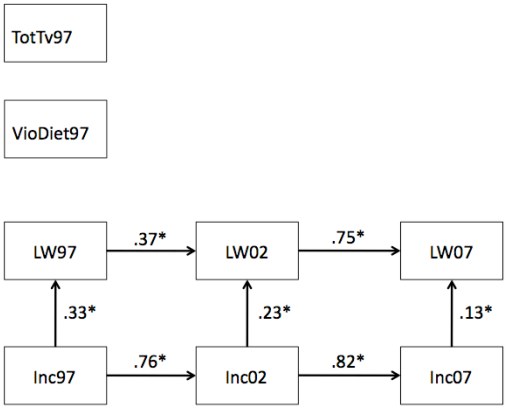
Model C: Enduring Effects Model



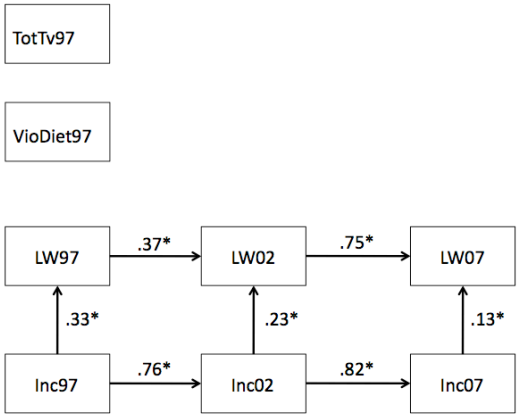
Note: All model estimates presented are standardized. Abbreviations: VioTVHrs = violent TV hours; LW = Letter-Word Identification; Inc = Income-to-Needs Ratio

Figure 9. Reading Models for Violent TV Diet

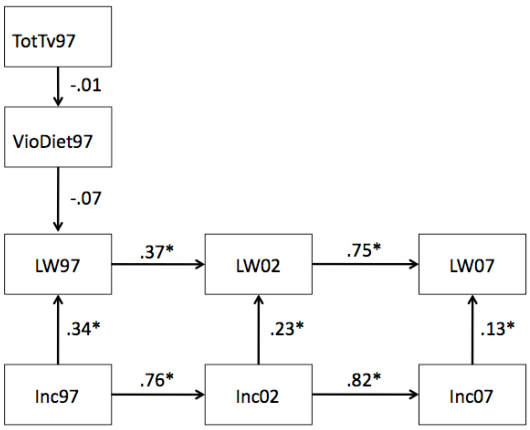
Model A: Stability Model



Model B: Revisionist Model



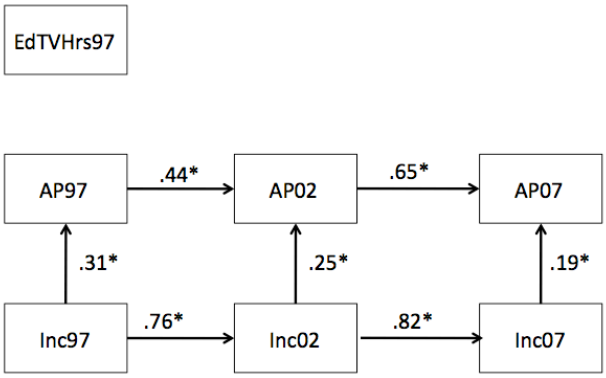
Model C: Enduring Effects Model



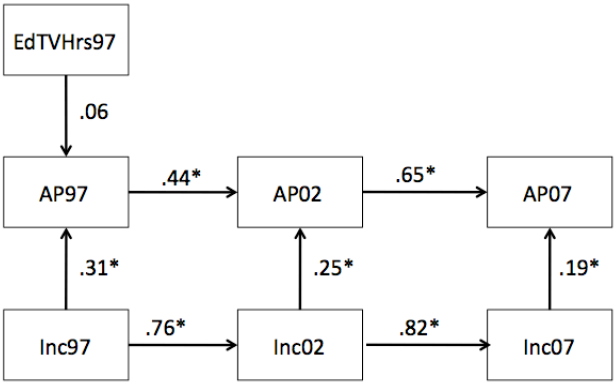
Note: All model estimates presented are standardized. Abbreviations: TotTV = Total TV time; VioDiet = Violent TV diet; LW = Letter-Word Identification; Inc = Income-to-Needs Ratio

Figure 10. Math Models for Educational Hours per Week

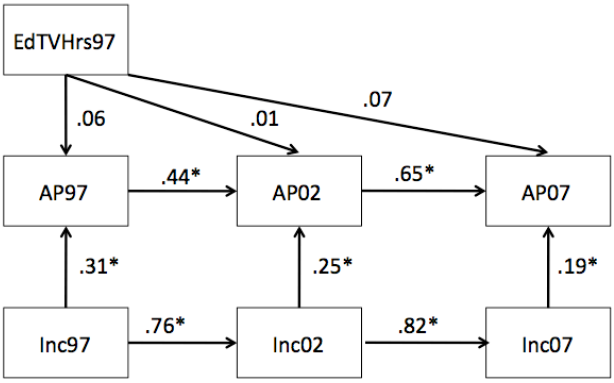
Model A: Stability Model



Model B: Revisionist Model



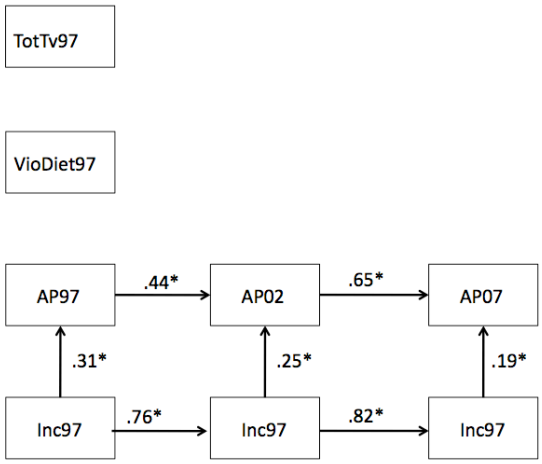
Model C: Enduring Effects Model



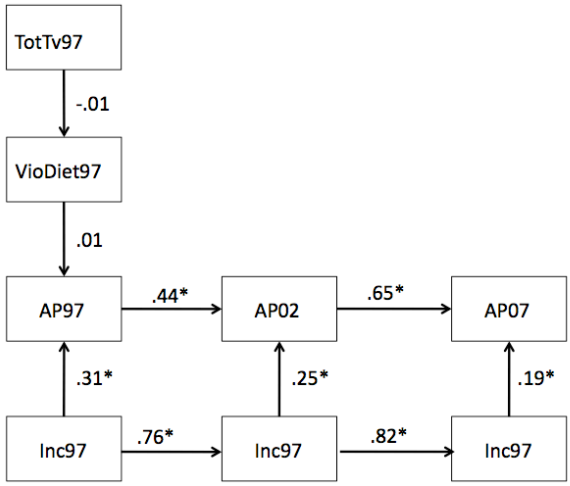
Note: All model estimates presented are standardized. Abbreviations: VioTVHrs = violent TV hours; AP = Applied Problems; Inc = Income-to-Needs Ratio

Figure 11. Math Models for Violent TV Diet

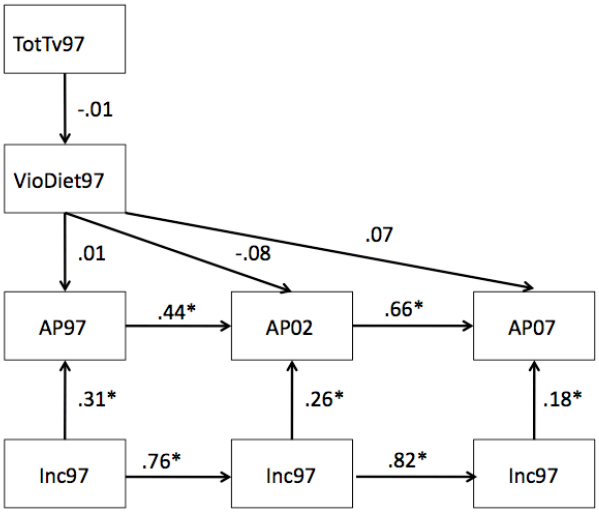
Model A: Stability Model



Model B: Revisionist Model



Model C: Enduring Effects Model



Note: All model estimates presented are standardized. Abbreviations: TotTV = Total TV time; VioDiet = Violent TV diet; AP = Applied Problems; Inc = Income-to-Needs Ratio

CHAPTER IV
DISCUSSION

Summary

Despite general public support for limiting children's exposure to television (e.g., AAP 1999; 2011), few studies have longitudinally investigated whether educational television influences children's development while adjusting for and comparing to total TV time. This dissertation directly investigated multiple pathways through which early TV exposure may influence achievement. The primary aim of this three-time point study was to investigate how temporal associations between television and achievement unfold over time. Specifically, two types of models were tested to examine whether the use of a dosage model was predictive in different ways than a diet model.

Data from PSID families was utilized to model the longitudinal relationships between early television viewing, activities and behavior in middle childhood, and subsequent adolescent achievement. Demographic predictors were examined for their relative importance in these associative relationships. Finally, the longitudinal relationships between educational television viewing and the development of knowledge were investigated to better understand the importance of early viewing behaviors over the course of childhood. Results suggest that, when educational diet is used to predict achievement, viewing does not impose its influence through changes in behavior. Instead, the data suggest that educational television diet positively predicts the development of knowledge.

Sample and Predictive Power of Family Context

Sample

While the make-up of the sample is predominantly comprised of White families (~52%), the effort by PSID researchers to oversample minority families resulted in a large percentage of Black families in the sample (~38%). While the percentages of Hispanic, American Indian, and other race families were marginal, this sample's diversity leads to an ability to generalize findings to a more diverse population than those tapped in previous longitudinal work.

Further extending the generalizability of this sample, participating families were drawn from across the United States from each of the Census Bureau's nine divisions (U.S. Census Bureau, 2010). The average total family income of $46,564 with a standard deviation of $38,104 suggests a fair amount of variability in the socioeconomic status of sampled families. Compared to the 1997 national median income of $44,568, this sample's income was slightly higher than the national norm (U.S. Census Bureau, 2005).

Other demographics from this sample suggest that the children included in this work were primarily biological relatives or adopted children of the Head of Household living with one or more parents. Children were predominantly preschool age, with 25 percent being 3-year-olds and 29 percent being 4-year olds. Only 11 percent were children ages 7 or 8. This distribution should be considered when interpreting the findings of this study, particularly those that show no differences in the pattern of results by age.

On average, the Head of Household completed an average of 12.76 years (SD = 2.84) of education, suggesting that most families Heads' were high school graduates.

When examining children's TV viewing, children averaged 14.18 hours of total viewing per week (*SD* = 9.53), or 2.03 hours per day which is consistent with previous literature for average viewing time for children of this age (Common Sense Media, 2011). When breaking down these exposure averages by content, the average amount of educational viewing per week was 2.15 hours (SD = 3.13) versus an average of 3.15 hours of violent TV viewing (SD = 4.74). This suggests that children engaged in violent TV viewing more often than educational TV viewing, but also that the amount of violent viewing was more variable than educational viewing. Beyond glorified or ultra violent television content, it must be said that the category of violent viewing also contained slapstick or cartoon-like violence in addition to sports violence depicted as part of contact sports.

Family Context

The inclusion of family context variables (parent education and home environment) led to better fitting models for both the dosage and diet analyses. In the dosage model, neither the level of cognitive stimulation in the home nor parent education predicted the number of hours of educational television exposure. The findings regarding the home are inconsistent with the results from the Early Window Project such that the HOME Inventory predicts children's dosage or informative programming (Wright et al., 1995). However, the current finding that parent education was not predictive of children's educational viewing confirms previous PSID findings investigating the relationship between demographic predictors and television viewing (Lee, Bartolic, & Vandewater, 2009).

An interesting distinction between the dosage model and the diet model is the differing ways in which family context are associated with television variables. In the

dosage model, neither parent education nor the HOME subscale was associated with educational or violent hours of exposure. However, in the diet model, the HOME inventory positively predicted education diet (r = .19) and negatively predicted total television time (r = -.16). Interestingly, parent education had a small positive association with violent television diet (r = .10). It is hypothesized that, in 1997, parent education, a known proxy for socioeconomic status, may be associated with the availability of cable television in the home. While this information was not available in the PSID home survey until 2005, it is possible that this distinction, or the construct of SES in generally, may be partially driving this relationship.

The multi-group dosage and diet analyses did not reveal any difference in model fit by age, such that the pattern of relationships found for both diet and dosage were invariant by children's age at the time of measurement. This was consistent with the *a priori* hypothesis 3f. The hypothesis is based on the notion that these relationships should be the same or similar given the fact that children's television viewing is fairly consistent over time, and that the older children in the study were likely to have similar viewing habits as younger children (Anderson et al., 2001). However, it once again must be indicated that this sample was largely comprised of preschool children (n = 337). While 145 older children were included in the multigroup analysis, the sub-samples were not of equal size.

The original hypothesis about potential gender differences was that there would be differences between boys and girls in terms of the relationship between violent TV viewing and levels of externalizing problems; this expected result was based on the original findings of the Recontact Study that showed an association between higher diets

of violent television during early childhood and higher levels of aggression in girls (Anderson, Huston, Schmidt, Linebarger, & Wright, 2001). While the variant model (allowing boys' and girls' model parameters to vary) was not a significant improvement in fit over the invariant model, the standardized parameter for relationship between boys' violent hours of television exposure and externalizing problems was non-significant, .08, SE = .06, t = 1.23, whereas the relationship for girls nearly achieved significance, .09, SE = .05, t = 1.94. While the overall pattern of results was quite similar, there do appear to be trends suggesting a greater relationship for girls between violent television dosage and its influence on externalizing problems. If so, this trend is consistent with the results of the Recontact Study.

In summary, family context added an important component in predicting children's television viewing behaviors in both dosage and diet models. Also, when examining the full set of direct effects from television to achievement, they can be interpreted as controlling for the influence of parent education and the quality of children's home environments.

Television Dosage

This study builds upon findings from previous research that have demonstrated links between hours of television viewing (dosage), achievement, and the displacement of academically important activities and behaviors. In this study, as hypothesized, independent reading in 2002 was positively associated with reading achievement in 2007; this finding corroborates previous research demonstrating these associations (Block & Mangeieri, 2002; Graeney, 1980). Though expected, the association between independent reading and reading self-esteem 2002 did not achieve full significance. However, reading

self-esteem positively predicted reading achievement (r = .20) and math self esteem was positively associated with math achievement (r = .29). While internalizing problems did not negatively predict reading and math achievement as expected, externalizing problems were negatively associated with both types of achievement in 2007 (r = -.14 for reading; -.12 for math). The effect sizes are small but consistent for both types of achievement. These results partially confirm previous research suggesting that children who have behavior problems early on typically show less achievement later in life (Darney, Reinke, Herman, Stormont, & Ialongo, 2013; Petras, Chilcoat, Leaf, Ialongo, & Kelham, 2004; Tremblay et al., 1992). Surprisingly, positive behavior was not predictive of math or reading achievement. These results suggest that, of the behaviors modeled in this study, externalizing problems (e.g., aggression, refusal to follow rules, impulsive behaviors) are those most strongly associated with differences in achievement.

Educational TV Dosage

While a long-term positive relationship with 1997 educational TV hours was present for later math achievement in 2007, it was not present for reading achievement in 2007. These findings are inconsistent with those of the Recontact Study which found significant relationships between hours of preschool educational television viewing, *Sesame Street* in particular, and high school students' grades in math (Anderson et al., 2001).

Contrary to *a priori* hypotheses, the number of hours spent viewing educational programs did not positively predict the intermediate outcomes of independent reading, academic self esteem (reading and math), or positive behavior in 2002 as initially expected. These findings are inconsistent with previous research suggesting that

educational programs can boost positive attitudes toward reading, science, and math (Linebarger, 2000; Rockman Et Al., 1992; Rockman Et Al., 2002; Wood & Duke, 1997). Two caveats should be considered when comparing these sets of findings; one is that several of these studies cited above measured the short-term effects of program exposure on children's educational attitudes. It is possible then that viewing may not change longer-term attitudes towards learning (five years later). Second, the definitions used for this study and those mentioned above are loosely connected constructs. Interest in learning and motivation for learning may not necessarily translate into similar findings for measurements of perceived self-competence in academic content areas. Further research is necessary to parse these relationships. No known research examines the short-term influence of educational television on academic self-competence as measured in the current study. Additional research could examine whether the effects occur after a short period of exposure.

Similarly, the hypothesis that educational TV hours would be negatively associated with intermediate internalizing problems and externalizing problems were not demonstrated in the data. These findings are also inconsistent with previous research suggesting that educational programs can have positive effects on children's behavior (Mares & Woodard, 2001), but again, such effects may not have enough longevity to be present five years later.

In considering the lack of educational television dosage effects, several interpretations are possible. One could conclude that educational television did not influence achievement positively through the mechanisms tested in these models. There was no indication that educational TV dosage positively influenced intermediate

independent reading, academic self-esteem, prosocial behavior, or decreased internalizing problems and externalizing problems as measured five years later. It is possible then, that educational television does not have a mechanistic influence through long-lasting changes of behavior, but instead, more directly by increasing children's knowledge. An alternative consideration is that educational television benefits children by doing no harm to intermediate behavior and independent reading. Unlike other types of TV content, educational television may not decrease children's independent reading or increase problem behaviors because it is on par with other high-quality displaced activities. This interpretation is consistent with the theory of Comstock and Scharrer (1999) that suggests that displacement typically occurs when children are exposed to media that possess less value than that of the displaced activities.

Violent TV Dosage

As expected, the number of hours of violent TV viewing in 1997 was negatively associated with independent reading in 2002, prosocial behavior in 2002, and positively predictive of externalizing problems in 2002. These results support previous PSID findings of contemporaneous effects of violent TV viewing in 1997 and children's social isolation (Bickham & Rich, 2006). It is also in line with the findings of Christakis and Zimmerman (2007) which utilized PSID Child Development Supplement data and found support for a positive relationship between preschool violent TV viewing and antisocial behavior 5 years later.

In this study, violent television hours were not predictive of reading or math self esteem. Evidence for a mediating displacement relationship was investigated between violent TV hours, independent reading, and later achievement. Though the direct effect

from violent TV to reading achievement was not significant (with or without the indirect path in the model), a model including the indirect effect from violent TV hours to independent reading resulted in a significant improvement in overall model fit. Approximately 17 percent of the overall effect of violent TV hours on achievement flows through independent reading. However, the total effect of violent television on reading was not significant. Longitudinally, the number of hours of violent television exposure in 1997 was not associated with reading or math achievement a decade later in 2007.

Because the effects in this study represent correlational relationships between two measurements, there are multiple possible interpretations. On one hand, it could be that violent content that does not contain valuable educational messages displaces children's independent reading. On the other hand, it may be that children and families who view this type of violent programming on a frequent basis encourage independent reading less. Likewise, just as it is possible that violent television exposure led to increased externalizing problems, it is also plausible that behavior problems preceded early television viewing.

In earlier work using models that tested for cross lagged effects, Huesmann et al. (2003) found that child TV violence viewing was significantly associated with adult aggression, however the reverse relationship, child aggression to adult violence viewing, was not. Such a finding implicates television as the causal agent, but other interpretations involving third variables (such as unmeasured characteristics of families) remain open.

In sum, the dosage models partially support a displacement effect, insofar as some types of television exposure may displace time spent on academically beneficial activities. However, this conclusion is limited to violent television dosage. It is possible,

then, that educational television imparts a more direct effect on children's long-term achievement in different ways than the pathways investigated here.

Television Diet

As distinct from dosage (hours of viewing violent or educational content), TV diet was conceptualized here as proportion of total viewing occupied by each category of content. Previous longitudinal studies have often just looked at dosage effects of TV on achievement (Anderson et al., 2001; Ennemoser & Schneider, 2007; Hofferth, 2010; Linebarger & Walker, 2005; Minstry, Minkovitz, Strobino, & Borzekowski, 2007; Wright et al., 2001). Yet, many studies have noted that the quality of children's exposure is important in predicting differences in later academic outcomes. The diet model sought to parse the pathways through which varying television diets may influence children's activities and behaviors that subsequently affect achievement while at the same time adjusting for and estimating the impact of total TV time.

As the sample utilized for the diet model was identical to that used for the dosage model, the direct effects between the intermediate 2002 variables and achievement are consistent with results presented in the dosage section. The results that differ in the diet model are the relationships between family context and television viewing as well as the relationships between diet/total TV and achievement.

Total TV Time

Consistent with violent content from the dosage model, total number of TV hours per week in 2002 negatively predicted independent reading in 2002 (r = -.11) and also negatively predicted positive behavior (r = -.15), but was unassociated with self-esteem. Once again, these effects are small in size. Consistent with prior hypotheses, early total

TV time was positively associated with intermediate internalizing problems (r = .11) and externalizing problems (r =.10) in 2002. Assuming that these findings are due to the portion of total viewing that contains violent content (as found in the dosage model above), they confirm the previous findings of Christakis and Zimmerman (2007) that viewing violent television during the early years predicts antisocial behaviors later in childhood.

Children's total early TV time in 1997 was unassociated with long term reading or math achievement while controlling for TV diet, cognitive stimulation in the home, and parent education. This finding contradicts previous studies that suggest that total television time is negatively associated with achievement (Christakis et al., 2004; Zimmerman & Christakis, 2005; Zimmerman & Christakis, 2007). When adjusted for content diet, the results of the current study do not lend support to the idea that the more time children spend with television, the lower their achievement scores. As previously discussed, proponents of the medium-focused, total viewing perspective state that, with its excited pace, television viewing reduces children's interest levels in formal educational settings and may induce attention-related learning disabilities (Koolstra & Van der Voort, 1996; Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Miller et al., 2007). This study does not provide support for a linkage between amount of exposure and decreases in achievement.

Educational TV Diet

Educational TV diet in 1997 was positively associated with both reading (r = .09) and math achievement (r = .10) in 2007. These results suggest that, while these viewing hours may not impose effects on intermediate behavior or attitudes towards academics, it

is quite possible that early educational viewing influences early acquisition of knowledge and that this in turn positively influences intermediate and later acquisition of knowledge in a cascading effect lasting for at least a decade.

Early educational TV diet in 1997 did not predict intermediate independent reading, reading self esteem, math self esteem, or prosocial behavior in 2002. This was surprising given that educational television has been found to produce similarly-sized positive effects as compared to negative effects found for violent programming on children's aggression and behavior (Mares & Woodard, 2001). Instead, early educational television diet was not negatively associated with intermediate internalizing problems or externalizing problems in 2002. While these results were not expected, it is possible that the positive influences of early educational television viewing, particularly those on behavior, were too distal in this model, measured five years after the TV viewing data. In previous research, Friedrich and Stein (1973) found that, after a period of exposure to prosocial programming, children were found to engage in more prosocial behavior. After a several week delay, however, these effects weakened. It is possible that children's contemporaneous behavior is influenced by educational television but these effects weaken to non-significance over the measurement period of 5 years. In a more recent study of very young children's television exposure and subsequent effects on prosocial skills, Mistry and colleagues (2007) found that concurrent television exposure was more important in predicting children's social skills than early viewing.

Violent TV Diet

Longitudinally, violent TV diet in 1997 was unassociated with children's achievement in 2007. However, contrary to expectations, children's violent diets in 1997

were also unassociated with either intermediate internalizing problems or externalizing problems in 2002. This pattern of results is much different than that found in the dosage model which suggests positive relationships with internalizing and externalizing behaviors as well as negative associations with prosocial behavior. The dosage model, however, did not include children's total time spent with television, as this measure was expected to be collinear with number of hours of violent and educational television. Once total time spent with television is included in the diet model, the findings attributable to violent hours in the dosage model are, instead, associated with total time spent with television. These results are consistent with previous research examining the influence of children's overall time spent with television and negative effects on children's behavior (Shin, 2004). Comparisons of the dosage and diet models to previous longitudinal work will be discussed below.

Methodological Findings

To further investigate how much the addition of television diet variables added to the predictive power of the models, an additional model comparison test was run against the diet model. To do so, each of the paths to and from violent diet and educational diet were set to zero, leaving only the total amount of TV exposure to predict activities and behaviors in 2002 and later achievement. This allows for a direct comparison to the fully specified diet model including violent and educational TV diet. Results suggest that the model containing TV diet information was significantly better than the total TV only model ($\Delta\chi^2$ (20)= 47.22, $p < .05$). As additional evidence, partial R^2 statistics for reading and math achievement were compared across models. For the total TV only model, reading achievement was .16 and math achievement was .15. When educational and

violent diets were included, the R^2 for reading achievement rose to .26 and for math achievement it increased to .28, suggesting that the quality of children's television diets make a significant contribution in predicting pathways to achievement.

The TV viewing data provided by the PSID indicated substantial numbers of children with no hours of educational viewing or no hours of violent viewing. Several television studies have noted this methodologically problematic phenomenon (Barr et al., 2010; Skouteris & McHardy 2009). Some researchers decide that regression-based analyses are not appropriate for such analyses that have zero-inflated variables or non-normal distributions. Barr and colleagues (2010) came up with a creative way to deal with this issue by categorizing children into several diet-driven categories, noting them as high, moderate or low on categories of adult-directed or child-directed programming. While this solution begins to address the content issue of importance in children's diets, it does not fully characterize the balance struck between content and total time spent with the medium. This study utilized an analysis of covariance approach that, while it assumes multivariate normality, allows for corrections if variables do not meet the appropriate criteria.

This study is one of the first to compare outcome differences associated with the choice of television exposure variables. The model employing diet variables had a stronger relationship with family context predictors as compared to a model employing hourly dosage television variables. While neither model did a formidable job in demonstrating significant effects from TV on intermediate 2002 activities and behaviors, it also seems clear that total television time is a much closer proxy to time spent with violent television than for time spent with educational television. Finally, while effects

for educational TV were not present from viewing diet in 1997 to intermediate behaviors in 2002, these models suggest that long-term relationships do in fact exist between educational diet and achievement. The mechanism of influence may not influence achievement through changes in behavior problems or reading time. This suggests that educational TV may exert its influence through its proximal effects on children's knowledge. Early knowledge effects, in turn, may have positive feed-forward effects on later knowledge acquisition. If so, effects of early educational TV might be expected to have enduring effects on achievement. This is discussed in the next section.

Comparisons to Previous Diet/Dosage Research

Total TV Time

As previously stated, the current project found associations between children's total time spent with television and negative associations with independent reading and positive behavior as well as positive associations with behavior problems, comparisons of previous work can be drawn. To compare this evidence for displacement in the current work to previous research, Shin's analysis (2004) with the PSID data examined displacement effects in a different way. Shin's research focused purely on the total time children spent viewing television, regardless of content, using a sum of the weekday and weekend minutes as the television predictor. This measurement does not use a weighting procedure to estimate how much television viewing may typically occur over the course of a week, suggesting that weekdays and weekend viewing patterns may be different.

For intermediate variables, Shin used total time spent doing homework and/or studying, leisure reading with or without parents, and impulsive behavior that was measured from a subset of questions from the Behavior Problems Index. Academic

achievement was measured as a latent construct with indicators that incorporated four subscales from the WJ-R: Letter-Word Recognition, Passage Comprehension, Calculation, and Applied Problems. Her results suggest that total time spent viewing television was negatively associated with homework and studying and reading for leisure which were both, in turn, positively associated with achievement. Like the current study, Shin found that television viewing was positively associated with impulsive behaviors that were negatively associated with achievement.

While the current study confirms Shin's findings concerning effects of television on reading (albeit independent reading as compared to total time spent with books), this study has three major differences with Shin's investigation. This study's more nuanced look at TV dosage by content suggests that all television content types may not show equivalent displacement effects on achievement, that is, an hour of viewing violent content does not have the same impact as an hour of viewing educational content. The results from the current project show that, while the story of the dosage model (e.g., Gaddy, 1986; Shin, 2004) may hold up for hours of violent exposure as a negative predictor of independent reading, the present research suggests that different types of television exposure can show different patterns of displacement. The current study shows a relationship with violent hours of TV viewing and independent reading that is not found with hours of educational TV viewing. This finding suggests additional support for the work of Schramm, Lyle, and Parker (1961) such that violent television, often serial programs that possess complex plots and characters, may displace time spent with "functionally similar" reading materials in a way that educational programs, often non-serial and focused on skills and educational content, do not. Second, a more nuanced

look at achievement suggests that television viewing may not show uniform effects on all aspects of knowledge and achievement; the results of the current study show that the number of hours of educational television viewed is positively associated with math but shows no association with reading. Finally, Shin's study did not take into account any family context variables that may account for variability in children's television viewing behaviors. As Comstock (2013) notes, once socioeconomic status is controlled for, many displacement effects disappear. In the case of the current study, parent education and cognitive stimulation in the home were both included, with moderate direct effect sizes between reading (Parent Ed r = .23; HOME r = .23) and math (Parent Ed r = .22; HOME r = .23) achievement. It is possible that these relationships siphon off the previously documented direct association between television hours and later achievement. In other words, previously documented relationships may be an artifact of unmodeled family context.

Educational TV

Longitudinal research independent of the PSID partially supports and yet partially contradicts the relationships found through the current set of model. The association found in the current work between educational television viewing and reading achievement support the previous work by Ennemoser and Schneider (2007) that finds the same positive relationship. This original study, conducted with a smaller sample of German children shows similar longitudinal results with PSID American families.

The Recontact Study suggested that children who watched more informative television during the preschool years tended to have higher grades in high school, spent more spare time reading, and, for boys, was associated with decreased aggression. In the

current model, however, none of these associations were found between educational television dosage and achievement (cf, Anderson et al., 2001). A major difference between the current study and the Recontact Study is the outcome measure. The Recontact Study examined the relationship between television viewing and grades measured through student reports and transcripts, whereas the current project utilized a standardized battery of tests to represent children's achievement.

Another point of note is that the definition of what is meant by "educational" could have a significant effect on the findings. The Recontact Study coded children's viewing as child informative if it was seen as being "designed for a child audience with some intention of providing educational or prosocial content" (pg. 18). Alternatively, the coding of the PSID considered children's television educational if the program's "primary goal is to teach children specific skills and/or behaviors, eventually preparing them for more advanced, formal academic and/or social settings" (Vandewater, Cummings, & Lee, 2005; see Appendix B). Another difference is that the Recontact Study's longitudinal design was measured over two time points: preschool TV viewing and high school achievement. In this study, while achievement was measured during high school, the behavior problems variables were measured at an intermediate time point. Thus, the longitudinal comparisons drawn in this study to those outcomes are limited.

Violent TV

The results of this study partially support the dosage effects found by Anderson et al. (2001). The Recontact Study found that violent television viewing in preschool was associated with lower grades, higher aggression in girls, and less participation in

activities that cultivate leadership skills. In the current study, violent TV hours were positively associated with higher parent reports of child behavior problems, decreased prosocial behavior, and displacement of academically-beneficial activities as measured by independent reading. The present dosage analysis provided further support with a more broadly-based sample than that of the Recontact Study. While aggression was not directly measured in the current study, large gender differences in TV's association with behavior problems were not found in the current project data. Although a trending difference between girls and boys in the way television affects externalizing problems was present, the overall model fit was not improved when allowing the model to vary based on the sex of the child.

Current results also conflict with previous research that suggests that a child's violent television diet predicts long-term aggression (Huesmann et al., 2003). However, in the longitudinal study by Husessmane et al. (2003), researchers modeled children's violent TV diets in a much different way. For each year that children were interviewed, they were asked to rate the frequency that they viewed ten different popular television programs that ranged from non violent to violent. Children rated frequency from "once in a while" all the way to "every time it is on" (pg. 205). These frequency ratings alongside violent content coding performed by trained research assistants were used to obtain weighted scores for children's violence diet rated by the frequency with which they viewed these programs. While this measure does not provide a sense of their total amount of exposure, these data that do not rely on typical diary methods, showcase one way to capture diet that may not be plagued with censored or zero-inflated valued. However, it is possible that using retrospective reports from 6 to 11 year old children may

not lead to the same conclusions as those drawn from parent reports of time-use diaries.

Another possible difference is that including total TV time in the model, which was not done in the Huesmann study, may siphon off the effects between violent television and externalizing problems. Alternatively, in the dosage model, violent hours may possibly be a proxy for total time spent with television. The correlation between these two variables is .51.

Finally, it is also possible that the measurement of externalizing problems was too different from Huesmann et al.'s aggression measurement to produce similar findings. As the outcome of interest was adult aggressive behavior, measures were gathered from self-reports, reports from others (spouses, close friend, or significant other), and archived state data on criminal records. These measures of aggression are much more detailed and longer-term than the measures of externalizing behaviors tested in the current study.

While it is often difficult to compare and contrast the results from longitudinal studies that do not use the same construct measurements, this study shows support for a great deal of previous work on children's exposure to educational television and subsequent achievement.

Educational Media's Long-term Influence on Knowledge

This study was the first media investigation to use a series of model tests originally proposed by Fraley, Roisman, and Haltigan (2012). This modeling process allows the comparison to be made across different theoretical models for the relative influence of early TV viewing on achievement throughout childhood. Much of the literature surrounding the effects of educational television questions whether positive effects are significant only in the short term or whether they persist over time. On one

hand, the effects may be only to enhance knowledge specific to the age-appropriate curriculum of the particular program that is viewed. By itself, such enhancement would have only a short-term impact. On the other hand, the enhancement may be enduring if the early knowledge provides a bootstrap base of knowledge that enhances later learning.

The results from the present analyses support the enduring effects model for children's educational TV diets and long-term, enduring relationships with reading and math achievement. Of particular interest is that the relationships between early educational viewing diet and achievement are slightly different in size when comparing across reading and math achievement effects. While the enduring effects model was the best fit to the data for reading achievement, the strength of the relationship begins to decrease over time (r = .23 for 1997; .16 for 2002; and .05 for 2007). However, for math achievement, the relationship is initially smaller but endures over time (r = .11 in 1997; .09 for 2002; and .10 for 2007). Overall, the hypotheses for educational television diet were supported and consistent with results of previous longitudinal research examining the influence of children's educational TV diets (Anderson et al., 2001).

When the dosage variable of educational hours per week is used, the results are inconclusive. The stability model provided the best fit to the data and no significant, long-term relationships were found with exposure to educational television and later math achievement. For reading achievement, the revisionist model was the best fit to the data with early educational hours predicting early reading achievement (r = .19).

When the same series of longitudinal models were fit to the dosage and diet violence variables, no significant relationships were found for children's exposure to violent television and long-term achievement. This evidence contradicts prior work

suggesting a negative association between television exposure and later cognitive outcomes and achievement (Anderson et al., 2001; Zimmerman & Christakis, 2005). However, previous research examining the link between television exposure and achievement differst from the current work in terms of variables used for analysis. The Recontact Study found that violent TV diet was negatively associated GPA, but this result was just true for girls. The Zimmerman study utilized slightly different measures of television (hours per day of general exposure) and achievement (Peabody Individual Achievement Tests) and examined children's exposure to television before age 6. These methodological differences limit direct comparisons to the current study.

Methodological Findings

Perhaps most interestingly, the pattern of support found for the stability, revisionist, or enduring effects model changes depending on the television variable chosen for analysis. If educational hours were used to predict math achievement, no significant effects would be found, suggesting that, in absolute terms, an increasing dosage of educational television does not seem to promote math achievement. However, models suggest that early educational diet is consistently predictive of math achievement up to ten years later, even while controlling for SES. That is, increased proportions of television time that is educational are associated with later increased achievement. This finding has vast implications for the field of children and media research. When taking into account both total television time as well as the proportional data, the diet model incorporates how much television children watch but also the type of content they view. Because the diet model incorporates information on both the quantity and the quality of children's viewing experiences, this dissertation suggests that this conceptualization of

children's viewing is a richer and more valid approach in predicting later developmental outcomes.

In summary, it is recommended that, in future research examining the influence of children's television habits on developmental outcomes, that researchers consider the use of a television diet variable in place of one that simply characterizes dosage. When paired with a control variable of the total amount of television consumed, the diet variable provides a much richer characterization of how much of children's time spent with television is of educational value.

Limitations

Several limitations are important to consider when interpreting the results from this dissertation study. These considerations have been divided into two sections: methodological and theoretical limitations.

Methodological Limitations

The main issue is that the results stem from an analysis of correlational data. The PSID provides rich data for thousands of children and their families collected over a ten-year span. While these longitudinal analyses reveal associations between television viewing and achievement, it is not possible to infer unambiguous causal pathways from TV viewing to achievement. While the assumption of temporal precedence in these models insinuates that relationships flow in a particular direction, causal links are unavailable based on the analytic strategy. In the diet model, we find a significant negative association between the total time spent with television and children's positive behavior. The higher children's total time spent with television in 1997, the lower their parental reports of positive behavior in 2002. While the model predicts that children's

time with television influences behavior, it is quite possible that the direction of the relationship is reversed such that children with less prosocial behavior are drawn to spend more time with television. The same type of discussion could be held with the relationships between total TV time and externalizing problems or independent reading. To truly parse these associations, additional research, such as cross-lagged models (e.g., Berrington, Smith, & Sturgis, 2006) that measure the development of children's prosocial behavior alongside their media viewing habits over time would be necessary to model the development of these types of associations. Even these models would not provide completely unambiguous conclusions because there remains the possibility of mutual influence by unmeasured third variables.

Second, the methodology behind these models utilized path analysis as the model-testing technique. While the model estimates were obtained with valid and reliable data, other types of structural equation modeling techniques may lead to better parameter estimation. Utilizing a structural regression technique that estimates relationships between latent constructs that each has a measurement model create predictions between what are believed to be true construct scores devoid of measurement error (Kline, 2010). Utilizing latent constructs with valid measurement models assist the model in partitioning measurement error away from true scores. As much of the PSID data is available at the item level, future work could go into creating measurement models for each of the variables in these models.

Third, while diary data has been found to be a reliable indicator of children's viewing habits in the home (Anderson, Field, Collins, Pugzles Lorch, & Nathan, 1985), the number of children possessing zero values on TV content variables compared with

their parent reports of television exposure suggest a pattern of censored data, such that a long enough period of time did not lapse to gain a full picture of children's television exposure. While the current project utilized data from one typical weekday and one typical weekend day, it is possible that children's diets are more variable that what is depicted in this data.

Theoretical Limitations

The central relationships between exposure and achievement were analyzed, for the most part, in isolation from other important factors. While several factors of interest like SES, age, and gender have been investigated, other family context variables are suspected to play a role in predicting TV viewing and/or achievement. For example, previous research from Vandewater, Lee, and Shim (2005) suggests that family conflict plays a role in how much television children watch. The authors report that children may potentially utilize media as an escape mechanism within families of high conflict. Other research with the PSID data suggests that parental limits on children's time usage and family neighborhood quality are also important predictors of media use (Lee, Bartolic, & Vandewater, 2009). While the current study attempts to examine certain pathways through which family context may influence children's media usage, the intent was not to model all the pathways through which television use was predicted.

As a result, it is possible that these models are overly simplified. It would be naïve to suggest that early television viewing is the only important predictor of later achievement. Relationships in these data suggest that the correlation between children's educational viewing diet and their family scores on the HOME Cognitive Stimulation subscale is .19. While this correlation is significant, it does not suggest that educational

diet is simply a proxy for home environment. An interesting future direction would be to run the same series of nested models on the influence of the home environment on long-term achievement to obtain comparative effect sizes. While the current model does not include predictors of television viewing, it is probable that these relationships are more complex than that which is modeled here.

It must be noted that the associations between children's television viewing and achievement were measured over the course of a 10-year period. The results of models examining the influence of television on children's contemporaneous behavior (i.e. 1997 TV predicting 1997 activity and behavior predicting later achievement) could be quite different than the findings presented here. Additional models could be formulated to test the short-term effects of television and the implications of those effects on later achievement.

An additional consideration is that Anderson et al. (2001) had found that children's television habits tend to be fairly stable over time. It is possible that early television viewing is highly representative of children's contemporaneous educational viewing diets in 2002 and 2007. If this is true, then the modeled relationship may actually reflect the effects of contemporaneous educational TV diet effects on each achievement time point. Additional work would be necessary to examine change in diet more specifically and whether there is something very specifically special about early television viewing that sets a positive course for knowledge acquisition and achievement.

Finally, the results presented here are limited to children's exposure to television. One large drawback of this study is that children's media use from 1997 is somewhat dated. Television viewing in 1997 was relegated to the family's television set or sets.

The data from this era does not include current television practices such as video on demand, streaming media on portable devices, or media specifically designed for children under the age of 2. The application to children's lives in 2013 is limited, as contemporary media such as computers and other portable devices were not included in the analyses. A recent report from the Joan Ganz Cooney Center reports that 38% of children ages 2 through 10 use non-game educational activities on a computer or mobile device and 36% play educational computer games (Rideout, 2014). In addition, 28% of families report that children watch educational videos online and 24% play educational video games. While the focus of this project is on children's television diets, the more relevant term to contemporary research is media diet. While the current project does not incorporate children's exposure to alternative forms of screen media, future research should consider documenting children's total exposure to content across all media.

Future Directions

This study contributes to our understanding of the complicated relationship between television viewing and achievement. While in no way can these results be taken as a prescription for specific types of viewing behaviors, it does lend additional support to current thinking.

Current reports suggest that children spend approximately 36 percent of their screen time with media other than television (Rideout, 2014). For this reason, it is important to continue longitudinal investigations of family media use on a large scale in nationally representative samples like that of the PSID. While this type of research will always be somewhat dated (looking at media practices from 10 years prior), it still provides a great deal of insight as to how media practices shape children's development.

Beyond the continued monitoring of children's media practices over time, it would mean a great deal to dig further into the quality of children's contemporary media diets. As part of the PSID time diary data collection process, caregivers were asked to log each program title for shows that children viewed. These titles were utilized to code for aggregating television content data that is publicly available in the CDS data set. However, it is of great interest to dig further into children's television diets by specific content to understand the relative value of specific programs or types of program. For example, some of the most popular programs in 1997 for children were as follows: *Sesame Street*, *The Magic School Bus*, *Power Rangers*, *Blue's Clues*, *Star Wars*, *and Barney the Dinosaur* (Christakis & Zimmerman, 2007). Using program title data and aggregating exposure to specific programs or types of program would allow for a more finely tuned analysis of the differential effects of high-quality curriculum-based educational programming.

Other studies have found support for a curvilinear, negative, relationship between TV viewing and achievement (e.g., Fetler, 1984; Neumann, 1988; Razel, 2001), however, when it occurs it is mostly attributable to viewing during an early age. For example, in a meta-analysis of six studies examining the relationship between television viewing and achievement, Razel (2001) found that the shape of the relationship between total viewing time and achievement is shaped like an "inverted check mark" such that small amounts of viewing are associated with higher levels of achievement, whereas higher levels of viewing were associated with lower achievement (p. 371). In addition, the peak of the curve depends on children's age, suggesting that a different level of optimal TV exposure may be present depending on age should also be investigated.

Lastly, methodological improvements could be made to the current study to refine parameter estimates between television, behaviors, and achievement. Utilizing measurement models to construct latent constructs would allow models to account for measurement error. Future work with structural regression would allow for more complex analyses to examine the relationships discussed in this project.

Conclusions

Neither educational hours nor educational diet were predictive of children's intermediate activities or behavior problems in 2002. In contrast, total TV time and violent TV, depending on the type of model used, was predictive of independent reading, and internalizing and externalizing problems, and less prosocial behavior. However, in examining the long-term effects on adolescent achievement 10 years later, it was educational television that was positively associated with reading and math achievement.

Educational television was not found to have an effect on children's intermediate behavior in a positive or negative direction. However, many previous studies have examined the short and long-term effects of educational television exposure on the development of children's social skills, noting positive associations with viewing time (Mares & Woodard, 2005 or see Fisch, 2004 for a review). While the results from the current project have not found results that support prior work, additional research is necessary to examine the pathways through which educational television may influence children's short-term and long-term behavior.

Across all of the longitudinal models, this project demonstrates a lack of significant effects between total TV exposure and/or violent TV exposure and long-term

achievement. While the diet and dosage models accounted for family context using parent education and the measures of the home environment, the longitudinal nested models used families' income-to-needs ratios at each time point to control for the effect of SES on achievement. While some evidence was found to suggest potential displacement of independent reading by television time, it is likely that the inclusion of family context variables lessened the significance of the direct effect from violent television to achievement. This phenomenon, what Comstock (2013) referred to as a "vanishing relationship", has been documented in several studies examining the relationship between television and achievement (Gaddy, 1986; Gortmaker, Salter, Walker, & Dietz, 1990).

This study provides a methodological comparison of the use of two different conceptions of television exposure and the unique relationships modeled through each. When using measures of dosage in the form of hours, several kinds of relationship are obscured. Using measures of violent and educational content may lead researchers to believe that certain effects are associated with content rather than through total TV time. However, using a model that combines proportions of content exposure with total TV time may present a clearer picture about the impact of exposure. This finding is important for researchers examining the effects of television on children's cognitive and behavioral outcomes. Careful decision-making should be utilized in choosing television variables for analysis.

These results have implications for media producers or government organizations that decide how to allocate funding to the development of educational television and other media. The findings support the vast literature indicating that educational

television makes a significant contribution to children's acquisition of knowledge. The Recontact Study found that shows like *Sesame Street* were particularly important when examining associations with positive adolescent outcomes (Anderson et al., 2001). It should be noted that these types of programs are the result of a collaborative process between teams of child development specialists, educators, curriculum developers, and producers to ensure that program content would be effective in addressing certain skills. It is therefore not surprising that an hour spent watching a program such as *Sesame Street* is not equivalent to an hour spent watching other types of content. In the future, additional work should be commissioned to understand which types of contemporary programs (including those distributed to children in the form of apps for portable devices) are particularly effective in influencing long-term achievement.

Finally, the results of this work should be particularly relevant for parents. It is often the case that caregivers will ask "how much television should I let my preschooler watch" or "should they only watch shows like *Sesame Street*?" The findings from this work support the message of moderation. Just as dieticians will tell parents that children may consume small amounts of sugar in moderation, it is likely that small amounts of general audience programming will likewise not be harmful to preschool or school-age children. What seems to be important, instead, is maintaining a moderated, well-balanced media diet that contains a substantial proportion of enriching, high-value content. While this study has not determined an ideal dosage of media, it suggests the importance of utilizing media in ways that do not offset other highly valuable life experiences such as independent reading.

Over the course of a typical day, 47% of 2 to 10-year-old children are estimated to spend no time with educational media (Rideout, 2014). That said, children's diets vary across platforms. Among these same 2 to 10 year old children, television diets are estimated to be approximately 44% educational on average, whereas video game diets are 18% educational, and computer/mobile media are estimated at 36% educational. While progress is being made in terms of parents' understand of the importance of a healthy media diet, more research is necessary to ensure that high-quality programs are available across all platforms in order for families to make good choices about not only how much exposure children receive, but that the exposure time that they do get is filled with high-quality experiences.

In summary, this work confirms previous work suggesting that it is not the medium that is important; rather the message of the medium is most effective in determining children's outcomes. When it comes to children's academic achievement, the results of this project support a hypothesis put forward by Comstock and Scharrer (1999) that "viewing is positively related to achievement when the stimuli it supplies are intellectually and experientially richer than the available alternatives" (p.259). In other words, while controlling for the total amount of television viewed, educational television diet predicts achievement a decade later even after accounting for factors such as quality of the home environment and SES. Educational television can enrich children's experience; it can have a significant and long-lasting impact on children's academic performance.

APPENDIX A.

IRB CONSENT WAIVER MEMO

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70 Butterfield Terrace
Amherst, MA 01003-9242

Telephone: 545-3428 **FAX**: 577-1728

Human Research Protection Office
Research Affairs

M E M O R A N D U M

To: Heather Lavigne, Psychology Department
Professor Daniel Anderson, Chair of Dissertation Project
From: Margaret Burggren, Human Protection Administrator, HRPO
Date: October 30, 2013

Project Title: *The Impact of Television Program Diet on Children's Achievement*

The Human Research Protection Office (HRPO) has evaluated the above named project, and has determined that the study does not fall within the Regulations 45 CFR 46.

☐ The activity is not considered research under the human subject regulations. (Research is defined as "a systematic investigation designed to develop or contribute to generalizable knowledge.) [45CFR 46 102(d)]

☐ The activity does not involve research intended to obtain information about living individuals. [45 CFR 46 102(f)]

☑ The activity does not involve intervention or interaction with individuals OR does not use identifiable private information. [45 CFR 46 102(f)(1),(2)]

For additional information, please contact the Human Research Protection Office at 545-3428.

APPENDIX B.

PSID CHILD ACTIVITY DIARY INSTRUMENT (CDS-I)

Child Development Supplement

TIME DIARY

For:_____
(Child's name)

For:_____
(Day of the week)

The University of Michigan

Instructions

An important part of our research is to find out how children of all ages spend time during the week and on the weekends. The Diary is a listing of your child's activities during a weekday and during one weekend day. These diaries will help us collect the most accurate information possible, and your filling them out ahead of time will make the interview go more quickly. The time diary is from the perspective of the child and what the child was doing during a day.

- Please fill out the Time Diary for the **day of the week** specified on the front cover.
- Please fill out the Time Diary for the **child** listed on the front cover.
- Please use **one line** for each activity and write in what your child was doing.
    - If he/she was watching TV or playing a video or computer game, please write in the name of the program or game.
    - Please indicate who was doing the activity with the child and who else was in the same location (but not doing the activity with the child).
    - Please indicate if the child was doing any **other** activity at the same time.
- Please fill out the diary for the entire 24-hour time period, starting with midnight on the specified day and running until midnight on the next day. List the child's first activity of the day, the child's second activity of the day, on to the child's last activity on the day.
- On the following page, you will find some examples of these activities and how they would be filled out for this time diary. The following scenario is only an example of how to fill out a time diary. It may not be at all reflective of a day in the life of your child. Your interviewer will be glad to help you with any questions or problems you may have in completing the diary. Please give this diary to your interviewer at the time of your interview.

Any questions? Call 1-800-759-7947

What your child did from midnight until 7 in the morning

							DO NOT ANSWER IF SLEEPING OR PERSONAL CARE		
	A	B	C	D	E	F	G	H	J
TIME	What did your child do?	Time Began	Time End	IF WATCHING TV, was that a video tape or TV program?	IF TV, VIDEO, COMPUTER GAMES, what was the name of the (program/video/ game) child was (watching/playing)?	Where was child?	Who was doing the activity with child?	Who (else) was there but not directly involved in the activity?	What else was child doing at the same time?
Midnight		12:00							
7 AM									

What your child did from 7 in the morning until 12 noon

							DO NOT ANSWER IF SLEEPING OR PERSONAL CARE		
	A	B	C	D	E	F	G	H	J
TIME	What did your child do?	Time Began	Time End	IF WATCHING TV, was that a video tape or TV program?	IF TV, VIDEO, COMPUTER GAMES, what was the name of the (program/video/ game) child was (watching/playing)?	Where was child?	Who was doing the activity with child?	Who (else) was there but not directly involved in the activity?	What else was child doing at the same time?
7 AM									
12 noon									

What your child did from 12 noon until 5 in the evening

							DO NOT ANSWER IF SLEEPING OR PERSONAL CARE		
	A	B	C	D	E	F	G	H	J
TIME	What did your child do?	Time Began	Time End	IF WATCHING TV, was that a video tape or TV program?	IF TV, VIDEO, COMPUTER GAMES, what was the name of the (program/video/ game) child was (watching/playing)?	Where was child?	Who was doing the activity with child?	Who (else) was there but not directly involved in the activity?	What else was child doing at the same time?
12 noon									
5 PM									

What your child did from 5 in the evening until...

							DO NOT ANSWER IF SLEEPING OR PERSONAL CARE		
	A	B	C	D	E	F	G	H	J
TIME	What did your child do?	Time Began	Time End	IF WATCHING TV, was that a video tape or TV program?	IF TV, VIDEO, COMPUTER GAMES, what was the name of the (program/video/ game) child was (watching/playing)?	Where was child?	Who was doing the activity with child?	Who (else) was there but not directly involved in the activity?	What else was child doing at the same time?
5 PM									

...12 midnight

							DO NOT ANSWER IF SLEEPING OR PERSONAL CARE		
	A	B	C	D	E	F	G	H	J
TIME	What did your child do?	Time Began	Time End	IF WATCHING TV, was that a video tape or TV program?	IF TV, VIDEO, COMPUTER GAMES, what was the name of the (program/video/ game) child was (watching/playing)?	Where was child?	Who was doing the activity with child?	Who (else) was there but not directly involved in the activity?	What else was child doing at the same time?
Midnight		12:00							

A Day in the Life of an 8 year old child...

❶ The child's day begins with the child getting out of bed at 7:30 a.m. and going to the bathroom. As you can see, the mother recorded that her child was "sleeping" between midnight and 7:30 a.m. and then "getting up" as the primary activity from 7:30 a.m. to 7:40 a.m. Her child did not get out of bed immediately and had to be coaxed into getting out of bed so it took 10 minutes from the time he woke up to get to the bathroom. From 7:40 a.m. to 7:45 a.m. the child is in the bathroom. For activities such as "using the bathroom," "sleeping," "getting diaper changed," or other personal care activities, the last 3 columns (columns G, H, and J) of the time diary are not completed. These should be left blank for these activities.

❷ From 7:45 a.m. to 8:15 a.m. the child is eating breakfast and watching T.V. The mother lists this in the time diary as the primary activity "eating breakfast" and the secondary activity, "watching T.V." The child is primarily involved in eating breakfast and is only watching T.V. as an activity to do while eating. The child is eating breakfast with the mom, dad, and cousin who is staying over. So the mother lists this in the time diary as no one directly involved in the activity with the child but then lists her, the father, and the cousin in the next column as being present but not directly involved in the activity. (Note: If the child had been a baby, then it is possible for one of the parents to be directly involved in the activity of "eating breakfast").

❸ For 8:15 a.m. to 8:45 a.m. the child is getting ready for school. Then at 8:45 a.m. the mother drives the child to school. As previously stated, the diary is from the perspective of the child so the primary activity from 8:15 to 8:45 a.m. is getting dressed and then from 8:45 a.m. to 9:05 a.m. the child is "going to school." Notice that the primary activity is the travel to school and the secondary is talking to mother in car. The child is <u>not</u> "driving to school," that would be the mother's activity.

❹ The child is in school from 9:05 a.m. to 3:15 p.m. in the afternoon and then goes to the YMCA for an after-school program from 3:15 p.m. to 5:00 p.m. when child is picked up by the father. The child has told the mother and father a little about school that day and the after-school program and the mother has recorded it according to her knowledge of the child's schedule and the time the child reported doing the activity. Once again the ride from the YMCA to the home is recorded as "going home from YMCA." Also note how other people involved in the activities are listed.

❺ The child and father arrive at home at 5:30 p.m. and the child begins watching television while the mother prepares dinner. The mother lists the child's primary activity as "watching T.V." and then puts the name of the television program(s) in the space provided. The child is playing with toys while watching television , so playing with toys is listed under the secondary activity column.

❻ Starting at 6:00 p.m. the child eats dinner until 6:25 p.m. and then reads a book from the library from 6:25 p.m. until 7:00 p.m. The child then brushes teeth, watches T.V., and then goes to bed at 9:00 p.m. The mother lists that the child is "listening to a bedtime story" from 9:00 p.m. until 9:20 p.m. and then the final activity is "sleeping" from 9:20 p.m. until midnight.

							DO NOT ANSWER IF SLEEPING OR PERSONAL CARE		
	A	B	C	D	E	F	G	H	J
TIME	What did your child do?	Time Began	Time End	IF WATCHING TV, was that a video tape or TV program?	IF TV, VIDEO, COMPUTER GAMES, what was the name of the (program/video/ game) child was (watching/playing)?	Where was child?	Who was doing the activity with child?	Who (else) was there but not directly involved in the activity?	What else was child doing at the same time?
Midnight	● *Sleeping*	*12:00*	*7:30*			*at home*			
	Getting up	*7:30*	*7:40*			*at home*		*mother*	*arguing*
	Using the bathroom	*7:40*	*7:45*			*at home*			
	● *Eating breakfast*	*7:45*	*8:15*			*at home*		*mom, dad, cousin*	*watching T.V.*
	● *Getting dressed for school*	*8:15*	*8:45*			*at home*	*mother*	*dad, cousin*	*talking*
	Going to school	*8:45*	*9:05*			*in car*	*mother*		*talking to mother*
	● *In school*	*9:05*	*3:15*			*school*	*teacher, other children*		*worked, played*
	Playing basketball	*3:15*	*5:00*			*YMCA*	*other children*	*counselor*	*talking w/ other kids*
5 PM	*Going home from YMCA*	*5:00*	*5:30*			*In car*	*father*		*talking*
	● *Watching TV*	*5:30*	*6:00*	*T.V. program*	*Wishbone*	*at home*	*father, cousin*	*mother*	*playing w/ toys*
	● *Eating dinner*	*6:00*	*6:25*			*at home*	*father, mother, cousin*		*talking*
	Reading book from library	*6:25*	*7:00*			*at home*		*cousin, mother, father*	
	Playing computer games	*7:00*	*7:30*		*Oregon Trail*	*at home*	*cousin*	*mother, father*	
	Taking a bath	*7:30*	*8:20*			*at home*			
	Brushing teeth	*8:20*	*8:30*			*at home*			
	Watching TV	*8:30*	*9:00*	*Video*	*Aladdin*	*at home*	*cousin*	*father, mother*	*hitting cousin*
	Listening to bedtime story	*9:00*	*9:20*			*at home*	*mother*	*father*	

Midnight	*Sleeping*	*9:20*	*12:00*			*at home*			

Please answer the following questions:

A1. Who completed the time diary? **(Please circle)**

1. Mother/Primary Caregiver alone
2. Mother/Primary Caregiver and target child together
3. Child alone
4. Other (specify): _____

A2. How typical was this day (for that day of the week)? **(Please mark an X in the box)**

Very Typical.....Not at all Typical

1	2	3	4	5

A3. On what date was this diary completed?

_____**(MONTH)**_____**(DAY)**_____**(YEAR)**

APPENDIX C.

TELEVISION CONTENT CODING MANUAL

Television Content Coding Manual:

Designed For Use with Time Diary Information from the PSID Child Development Supplement (CDS)

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Hope M. Cummings

H. Erin Lee

The University of Texas at Austin

December, 2005

General Instructions

1. Thoroughly read through the general instructions and category descriptions BEFORE you start any coding. You should familiarize yourself with the types of categories and labels we will be coding for: (1) know what categories and labels there are, and (2) know what each of the categories and labels is aiming to capture. Also, from time to time, refer back to the instructions and descriptions to refresh your memory. A full understanding of the manual is required if you are to achieve consistency and reliability in your coding.

2. Each program will be coded for the following eight categories:
(1) Format;
(2) Intended Audience;
(3) Character Age;
(4) Genre;
(5) Comedy;
(6) Science Fiction, Fantasy or Supernatural/Paranormal (SF/F/SP);
(7) Curriculum;
(8) Violence.

3. You should work on one category at a time, rather than work on one title at a time. For example, code all of the titles for *Format* only, and when you are finished with this category, THEN move on to the next category, which is *Intended Audience*, and code all of the titles for that, and so forth. This means that on the coding spreadsheet, you will code down one column, and when you reach the bottom, you will move back up to the next column and work down the titles again.

4. Please go online and make a search on each title to CONFIRM what it is BEFORE you code or skip it.

5. If there are multiple programs of the same title, code the program that was aired/released closest to the time period that it was recorded as being viewed (1997 or 2002). If this is not applicable, code the program of the greatest general popularity or recognition. For example:

- *Ocean's 11*: There are two versions of this film. One was released in 1960 and the other in 2001. If this title comes from the 1997 wave, code the 1960 version. If this title comes from the 2002 wave, code the 2001 version. Although the latter is a remake of the former—meaning that there may not be any extreme differences between the two—you must select only one and consistently focus your coding on that one film.

- *Two of a Kind*: There are various TV shows and films released with this title. Further, they are not remakes or sequels of one another thus, having almost nothing in common. In such case, it becomes even more important to choose which program you will code for. If this title comes from the 1997 wave, code the most recent one before 1997. If this title comes from the 2002 wave, code the 1998 version, which is the most recent before 2002.

6. If there is no exact match between the given title and an actual program, code for the program with the most reasonably similar title. If the title reflects multiple programs, code for the first program only. After you have chosen a program to code for, apply Instruction #5 if necessary.

7. If the given title is the name of a network or channel (ex. HBO, Channel 24), code ONLY for the *Genre* category (ex. 18 for "Network Only" or 19 for "Channel Only"). All the other categories should be coded as "Uncodeable (=9)." HOWEVER, when the name of a network is given and all of the programs on this network are essentially of the same characteristics, you may code for the *Genre* category as you would for any individual program title (beyond 18 and 19). In such case, you may code for the other categories as well when applicable. For example, although *Food Channel* is a name of a network, because all the programs that it airs are of common characteristics that fall under "DIY/Hobbies (=3)" in the *Genre* category, it can be coded as so. Also, it may be coded for the remaining seven categories when applicable.

8. DO NOT code a title that you are NOT FAMILIAR with! In order to code a program, you must either have viewed it or have working knowledge of its content, characters, audience, etc. If you can get a good sense of the program through a variety of sources and feel comfortable with the level of information that you have, you may go ahead and code it.

9. The following is a list of Internet resources that provide detailed information about TV shows and films. Please refer to these sources only to refresh your memory and to clarify your personal knowledge of the programs.

- The Internet Movie Database (IMDb): www.imdb.com

- TV Tome: www.tvtome.com

- TV Guide Online: www.tvguide.com

- Official websites for TV networks, TV shows, films, etc.
  ex. ABC (www.abc.com), CBS (www.cbs.com), NBC (www.nbc.com), MTV (www.mtv.com),
  PBS Kids (www.pbskids.org), Playhouse Disney (disney.go.com/playhouse), Nickelodeon (www.nick.com)

- Media monitoring/review sites
  ex. Parent Television Council: www.parentstv.org
  Screen It: www.screenit.com – conduct search on Google by entering "*title* screen it"

- Others: Wikipedia, the free encyclopedia (en.wikipedia.org), fan sites, etc.

Some of these sites offer access to film previews. These can be very helpful. Please take a look at them when you can.

Please keep in mind that some of these sites may offer very subjective opinions and take biased perspectives on certain aspects of the programs. They may also use the same vocabulary (ex. format, audience, genre, science fiction, curriculum, violence, etc.) found in

this manual, but you should be very careful NOT to rely on their conceptualization and framing of these terms. Try your best to refer only to the descriptive 'facts' that these sites provide. Also, please try to consciously direct your understanding and application of the specific terms, which are used for the categories and labels, to the conceptualizations and descriptions offered in this manual.

If you have to rely ENTIRELY on these external resources and feel that you do not have enough information to reasonably and confidently code a program, please DO NOT do so.

10. If you encounter any problems or have any questions during any stage of the coding process, always discuss them with the other coders as soon as possible.

Categories and Descriptions

I. *Format*

Determine the format of the program in terms of its technical mode of presentation.

The program must fit into one of the following three labels (0~2) or be coded as "Uncodeable (=9)":

Value	Label	Definitions & Examples
0	**Live-Action**	Features life-like characters and scenery throughout entire program. Includes the appearances of people, puppets, animatronics, etc. Most science-fiction and fantasy programs (see SF/F/SP category) can be coded under this label. ex. *Mr. Rogers, Friends, Law and Order, American Idol, Jurassic Park, Star Wars, Andromeda, Matrix, Harry Potter, Lord of the Rings*
1	**Animation / Cartoon**	Completely animated and does not feature any life-like characters or scenery. Made up of images generated from drawings, special techniques or technology. Includes cartoons, claymation, computer graphics, etc. ex. *Looney Tunes, Lion King, Little Mermaid, Dora the Explorer, South Park, Simpsons, Barbie Nutcracker, Wallis and Gromit, Shrek, Toy Story*
2	**Combination**	Uses both live-action and animation. Uses them either (a) simultaneously; (b) going back and forth; or (c) both (a) and (b). Usually, the animations are not intended to pass as life-like or function as live-action portrayals. It is natural that the viewer is aware and conscious of the fact that both formats are being used together. ex. *Sesame Street, Space Jam, Lizzie McGuire, Who Framed Roger Rabbit, Jay Jay the Jet Plane, Theodore Tugboat, Thomas the Tank Engine, Between the Lions, Mary Poppins*
9	**Uncodeable**	It is impossible to accurately discern the format from the information provided.

II. *Intended Audience*

Determine the audience that the program is primarily intended to reach.

Please note that coding for this category aims to capture the 'intended' audience, NOT the 'actual' audience. In other words, although there are programs that become popular among unintended audiences, these secondary audiences should not be considered within this category. For example, the movie, *Shrek*, was originally intended to target children but have contingently become popular among adults as well. In this case, the appropriate label for this movie is "Children (=0)" [NOT "General (=3)"].

Some programs are intended to appeal to both adolescents and adults. For example, the movie, *Spiderman* (2002) targets an adolescent audience as well as an adult audience. In this case, you should code UP in order to capture the older audience and label it "Adults (=2)" [NOT "Adolescents (=2)"; NOT "General (=3)"].

The program must fit into one of the following four labels (0~3) or be coded as "Uncodeable (=9)":

Value	Label	Definitions & Examples
0	**Children**	Aimed specifically at children, from pre-K through elementary school age. Ways to assess this: toys, food, or games are marketed based on the program; commercials that air during the program are child oriented; programs are originally aired in the mornings (in particular, Saturdays and Sundays) or in the afternoons (after school). ex. *Teletubbies, Sesame Street, Nick Jr.* shows, *Spongebob Squarepants, Spy Kids, Looney Tunes, Shrek, Ice Age, Mary-Kate & Ashley Olsen* videos (those produced between 1995~97; all titles listed in 1997 wave), *Care Bears, Monsters Inc., Inspector Gadget*
1	**Adolescents**	Designed for an adolescent audience of middle- and high-school age. Usually depicts situations that this age group may experience, featuring characters that are of this age group. ex. *Saved by the Bell, Lizzie McGuire, The OC, Beverly Hills 90210, Dawson's Creek, Harry Potter*; *That's So Raven, Punk'd, Cribs, Making the Band,* sports shows such as Little League, high-school cheerleading, etc.
2	**Adults**	Consistently contains adult situations or language including, but not limited to, sexual innuendos and graphic violence. Dialogue, vocabulary, and plot tend to be complex. (Targeted to 'your parents' or the 18-34 demographic.) ex. *Law and Order, CSI, Desperate Housewives, Lost, Swan, Friends, Everybody Loves Raymond, Seinfeld, SNL, Real World, American Idol, NFL, NBA* games (most sports shows), news, award shows, culture/science/history documentaries

3	**General**	Consciously designed for all audiences; intended to appeal to a wide-range of audience. Appropriate for children to watch but simultaneously fun for adults to watch as well. The level of violence, sex or language is usually mild. Often focuses on the adventures of a family. Usually is a sit-com or drama format. ex. *Seventh Heaven, Full House, Cosby Show, Leave it to Beaver, Bernie Mac Show, The Waltons, Little House on the Prairie, Brady Bunch, Sound of Music, Free Willie, America's Funniest Home Videos, Annie, Miracle on 34th St., Jack Frost, Mouse Trap, Honey I Shrunk..., MLK Parade,* nature docus, home videos
9	**Uncodeable**	It is impossible to accurately discern the intended audience from the information provided.

III. *Character Age*

Determine the age-range of the characters that the program consistently revolves around.

Please note that coding for this category aims to capture the age-range of the 'fictional characters' that are being portrayed within the program, NOT the age-range of the 'real actors' who play the characters. Only in the case of non-fictional programs should the age of the actual personalities be assessed.

Code the program for this category regardless of its format. The age of non-human characters, such as talking animals and puppets, should also be coded when applicable.

Do NOT consider characters that are peripheral to the overall storyline. For example, parents can appear in a program that revolves around the children, where the children's adventures, exploits, and experiences are the primary focus. In this case, the age of the children should be determined, not the parents'; the appropriate label for this program is "Children (=1)" [NOT "Cross-Age (=5)"].

Do NOT consider voice-over narrators that are not visible. For example, off-screen narrators for nature documentaries are not considered to be characters.

The default label for this category is "Cross-Age (=5)." In other words, if a program features many characters but no salient 'main' character(s), it should be coded as "Cross-Age (=5)."

The program must fit into one of the following six labels (0~5) or be coded as "Uncodeable (=9):

Value	Label	Definitions & Examples

0	**No Character**	Programs that focus on real animals or that do not have any kind of 'characters,' etc. Age-patterns of the characters do not fit into any of the below categories. ex. nature and science documentaries, adult language programs
1	**Children**	Main characters featured are 10 years-old or younger. Usually, they are portrayed as elementary-school students or younger. ex. *Teletubbies, Muppet Babies, Land Before Time, Dora the Explorer, Nick Jr.* shows, *Little Rascals, Mary-Kate & Ashley Olsen* videos (those produced in 1995~97; all titles listed in 1997 wave)
2	**Tweens**	Main characters featured are 11 to 14 years-old. They are usually portrayed as middle-school students. ex. *Darcy's Wild Life, Endurance, Lizzie McGuire, Zoom, Amanda Show, Teen Nick* shows, *Mary-Kate & Ashley Olsen* videos (those produced in 1998~)
3	**Adolescents**	Main characters featured are 15 to 17 years-old. They are usually portrayed as high-school students. ex. *Beverly Hills 90210, Saved by the Bell, That's So Raven, My Super Sweet Sixteen, Dawson's Creek*

(*Character Age* continued…)

(*Character Age* continued)

Value	Label	Definitions & Examples
4	**Adults**	Main characters featured are adults (older than 18; "grown-ups"). They are usually in college, out of school, or employed full-time. Includes nature/animal shows with identifiable human host (voice-over narrators do not count). ex. *Law and Order, Dallas, Swan, Looney Tunes* (adult Bugs Bunny, Elmer Fudd, etc.), *Friends, Everybody Loves Raymond, Mr. Rogers, Real World, Animal Cops, Jeff Corwin Experience, Spongebob Squarepants,* dog pageant shows
5	**Cross-Age**	Both younger children and older adults appear together, all acting as the main characters on a relatively equal level. Each episode usually focuses on a different character, young and/or old. Often revolves around a family, with parents and younger children. Also, includes programs that feature main characters that grow up over time, equally portraying the characters during their younger and older years. ex. *Cosby Show, Seventh Heaven, Full House, Gilmore Girls,*

		Little Bill, Bambi, Lion King, Now and Then, The OC, Sesame Street, 3 Men and a Baby, Monsters Inc.
9	**Uncodeable**	It is impossible to accurately discern the ages of the characters portrayed from the information provided.

IV. *Genre*

Determine the genre of the program.

Coding for genre aims to differentiate between or among programs that are essentially different from one another. Please try to capture the key qualitative characteristic of the program. The program may have characteristics that pertain to more than one genre. In such case, determine the PRIMARY goal or focus of the program and code accordingly.

In order to facilitate the process, you may code this category simultaneously with the *Comedy* category, for which the descriptions are given in the following section.

The program must fit into one of the following twenty labels (0~19) or be coded as "Uncodeable (=99)":

Value	Label	Definitions & Examples
0	**No Genre**	Programs that cannot be classified under any specific genre. They do meet any of the below criteria. ex. home videos, commercials, infomercials, television guide channels, etc.
1	**News**	Discusses local, national, and/or international issues, usually with anchors or hosts. Includes news magazine shows, morning news shows, etc. ex. *Channel 28 News, Dateline NBC, 20/20, 60 Minutes, Good Morning America*
2	**Entertainment News**	Discusses issues concerning the entertainment industry (mostly TV, film, and music) and celebrities, usually with anchors, hosts, or voice-over narration. ex. *Entertainment Tonight, True Hollywood Story, MTV News, Extra, 101 Most Best Kept Secrets, Fashion Police, Fabulous Life of …*
3	**Do-It-Yourself / Hobbies**	Has primary goal of delivering information that may assist in elevating interests and developing skills for certain leisure activities, such as crafts, gardening, home improvement, cooking, physical fitness (yoga, pilates, aerobics), etc. ex. *Food Nation with Bobby Flay, Emeril Live, Trading Spaces, Martha Stewart, Travel Channel* programs, art shows

4	**Nature / Environmental**	Teaches lessons or conveys information about animals, the environment, or other nature related issues. Includes nature/environmental documentaries. ex. *Crocodile Hunter, Jeff Corwin Experience, Animal Rescue, That's My Baby, Animal Kingdom,* animal documentaries on *National Geographic*

(*Genre* continued…)

(*Genre* continued)

Value	Label	Definitions & Examples
5	**Reality**	Unscripted, spontaneous, and real-life narratives, which are intensified and dramatized through competition and unusual situations. Primary goal is to entertain, usually by appealing to voyeuristic impulses--watching how people interact when something is at stake, watching people do things you usually wouldn't or shouldn't watch them do. ex. *Survivor, Newlyweds, Wife Swap, Real World, Project Runway, American Idol, Cribs, Simple Life, Fear Factor, A Baby Story, Animal Cops*, *Cops,* court shows
6	**Game Show**	Contestants compete in a game that requires knowledge, skill, charm, and/or luck to win. Each episode usually contains one independent game with different contestants, ending with a winner who goes on to the final round. Usually takes place in the same studio/set. ex. *Wheel of Fortune, Jeopardy, Price is Right, Family Feud, Pyramid, Hollywood Squares, Legends of the Hidden Temple*
7	**Talk**	Features regular host(s) who interview or stimulate discussions with guests--who are celebrities, experts, or lay people--about their lives, opinions, and/or work. Usually takes place in the same studio/set. ex. *Oprah, Conan O'Brien, Jay Leno, David Letterman, Jerry Springer, Regis and Kelly, Larry King, Howard Stern, Crossfire*
8	**Variety**	Contains various skits or performances with the purpose of entertainment. Skits are not in sequential story form. Includes talent shows, pageants, award shows, etc.

ex. *MTV Music Awards, New Year's Eve Countdown, Showtime at the Apollo, Academy Awards, Miss America Pageant, Skating Show on Ice, Daily Show*

9	**Daily Life / Relationships**	Each episode revolves around the daily experiences and struggles of the main characters. Especially, relationships among people that live and/or socialize together are emphasized. Character development is an essential component. In many cases, there is potential for audiences to form parasocial relationships with the characters. Includes many "prime-time drama or soap operas" and sit-coms. ex**.** *Dawson's Creek, Melrose Place, The OC, Dallas, Judging Amy, Gilmore Girls, Dynasty, Edward Scissorhands, Friends, Everybody Loves Raymond, Seinfeld West Wing* * "Daytime Soap Operas" are coded separately under Label 13. * Most programs will contain elements of "Daily Life/Relationships." If the primary goal of the program is to convey that aspect, then it should be coded as so. However, if you find that a program equally contains elements of "Daily Life/Relationships" and elements of some other genre, code for the OTHER GENRE.

(*Genre* continued…)

(*Genre* continued)

Value	Label	Definitions & Examples
10	**Case Solving**	Each episode is engaged in solving cases which are mostly of criminal, legal, medical, and/or political nature. Usually set in a consistent workplace, such as FBI, law firm, hospital, etc. Dramatic stories that are often, but not limited to, being serious in nature. ex**.** *CSI, Law & Order, ER, Monk, Medical Investigation, X-Files, Cold Case Files, America's Most Wanted, City Confidential, Scooby Doo,* John Grisham films
11	**Action / Adventure**	Primary focus is to present the spectacle through physical stunts, big explosions, fight scenes, car chases, etc. And/Or the narrative revolves around the characters' non-mundane, risky, exciting, and/or dangerous experiences, quests, explorations, journeys, etc. ex. *Die Hard, James Bond, Terminator, Star Trek, Lord of the Rings, Matrix, Lethal Weapon, Indiana Jones, McGyver, Incredible Hulk, Knight Rider, Alias, Dukes of Hazzard, A-Team, Looney Tunes (Bugs Bunny, Road Runner, Tom & Jerry, etc.), Apollo 13, Goonies, Harry Potter*

12	**Horror / Thriller**	Primary goal is to scare the audience (to creep you out and give you nightmares). Includes the use of graphic and/or psychological horror. Repetitive and effective use of special effects and props (make-up, costumes, music, blood, chainsaws, etc.) to frighten and heighten tension/suspense. ex. *Nightmare on Elm Street, Scream, Friday the 13th, I Know What You Did… Seven, Silence of the Lambs, The Cell, Dracula, Psycho, Alien, Twilight Zone*
13	**Daytime Soap Opera**	On-going serial dramas that deal with matters of "daily life/relationships" but are programmed Monday through Friday, during morning and afternoon hours. ex**.** *One Life to Live, General Hospital, As the World Turns, Guiding Light, Young and the Restless, All My Children, The Bold and the Beautiful*
14	**Music Video / Concert**	Music videos and music shows. Includes weekly countdown shows, concerts, performances of various musical genres (classical, rock, folk, gospel…), etc. The primary goal is to introduce or perform music. ex. *MTV Hip Hop Countdown, Britney Spears Tour, Homegrown Music Concerts, Gospel Showcase,* general music videos * Music award shows should be coded under "Variety (=8)."
15	**Sports**	Any sports game, sports commentary, sports news, recaps, etc. ex. *Monday Night Football, BMX Biking, NFL Highlights, ESPN Sports Center, WWF, NASCAR*, dog pageant shows

(*Genre* continued…)

(*Genre* continued)

Value	Label	Definitions & Examples
16	**Documentary**	In-depth documentation or exploration of specific subject matter; usually culture, history, biography, science, etc. Presented in factual and informative manner, with no use of fictional characters or narrative. If the given title is a person's name and you cannot find a program of the same or reasonably similar title, code under this label. ex. *Modern Marvels, American Civil War, Beyond the Da Vinci*

		Code, Naked Science, America's Most Haunted Places, UFO Files, programs on *History and Discovery Channels* * Documentary-type programs that deal with 'nature' should be coded under "Nature/Environmental (=4)."
17	**Children's Education**	Primary goal is to teach children specific skills and/or behaviors, eventually preparing them for more advanced, formal academic and/or social settings. ex. *Sesame Street, Dora the Explorer, Blues Clues, Reading Rainbow, Zoom*, PBS shows aimed at children
18	**Network Only**	Only identifies the name of the network that the program is shown. ex. *ABC, NBC, Disney Channel, MTV*
19	**Channel Only**	Only identifies the number of the channel watched. ex. *Channel 2, Channel 36*
99	**Uncodeable**	It is impossible to accurately discern the genre from the information provided.

V. *Comedy*

Determine the comedic nature of the program.

In order to facilitate the process, you may code this category simultaneously with the *Genre* category, for which the descriptions are given in the previous section.

The program must fit into one of the following two labels (0~1) or be coded as "Uncodeable (=9):

Value	Label	Definitions & Examples
0	**Non-Comedic**	Comedy does not make up a salient or consistent part of the program's formula or appeal. ex. *CSI, Law & Order, James Bond, Mission Impossible, McGyver, Saving Private Ryan, Schindler's List, Star Wars, General Hospital, Jerry Springer, Oprah*
1	**Comedic**	Comedy makes up a central element of the program's appeal. There is a clear intention to make people laugh throughout the program. Consistently presents innuendoes, humorous statements, and/or physical comedy. Often includes a laugh track. If IMDb gives you "comedy" as the 'first' genre for a program, it is safe to code the program as comedic. ex. *SNL, Mad TV, Friends, Will and Grace, That's So Raven, South Park, Simpsons, Scooby Doo, Casper, Beetle Juice, Mrs. Doubtfire, Lethal Weapon, Rush Hour, Conan O'Brien, Daily Show*
9	**Uncodeable**	It is impossible to accurately discern the comedic nature from the information provided.

VI. *Science Fiction, Fantasy, or Supernatural/Paranormal (SF/F/SP)*

Determine the realistic nature of the program.

Please note that we are assessing the 'general, overall' nature of the program itself. That is, we are assessing only that science fiction, fantasy, or supernatural/paranormal which consistently makes up a major part of the regular formula of the program. You should NOT focus on 'irregular, occasional happenings' of one or two specific episodes or scenes. Also, you should NOT focus on happenings that occur only to characters of minor importance.

The program must fit into one of the following four labels (0~3) or be coded as "Uncodeable (=9):

Value	Label	Definitions & Examples
0	**Not SF/F/SP**	Programs that do not meet any of the below criteria. ex. *CSI, Law & Order, James Bond, Mission Impossible, McGyver, King of the Hill, Simpsons, Johnny Quest*
1	**Science Fiction**	Most often set in an extraterrestrial setting, such as non-earth planets and outer-space. Also includes extremely futuristic versions of earth, time-travel on earth, interactions between earth and the extraterrestrial (visits/invasions by extraterrestrial beings), and settings of alternative dimensions. Characterized by space ships, UFOs, aliens, time machines, robots, artificial intelligence, advanced technology, etc. Must be fiction. ex. *Star Trek, Andromeda ,Battlestar Galactica, Alien, Star Wars, 2001 Space Odyssey, Planet of the Apes, Back to the Future, Total Recall, Fifth Element, Men in Black, Invasion from Mars, ET, X-Files, Matrix, Superman, The Jetsons*
2	**Fantasy**	Features elements derived from myth, legend, folklore, or fairytales. Most often portrays an alternative, non-existent dimension of the universe or earth. Characterized by mystical activity such as magic, wizardry, sorcery, witchcraft, etc.; and by imaginary entities or creatures such as gnomes, trolls, dwarves, giants, elves, gods, wizards, witches, fairies, dragons, unicorns, monsters, demons, talking animals, animated objects, etc. Must be fiction. Includes cartoons that feature animals/creatures with human-like characteristics and personalities. ex. *Lord of the Rings, Harry Potter, Alice in Wonderland, Sleeping Beauty, Wizard of Oz, Peter Pan, Shrek, Aladdin, Princess Bride, Edward Scissorhands, Toy Story, Monsters, Inc., King Kong, Batman, Looney Tunes, Teletubbies, Sesame Street, Family Guy, Bambi, Little Mermaid, Godzilla, South Park*

3	**Supernatural / Paranormal**	Deals with abnormal phenomena, environments, or beings that cannot be explained by natural or physical laws, and that are mostly experienced by extrasensory, psychic, spiritual perception. Characterized by haunted houses, ghosts, spirits, God, the Devil, reincarnation, religious miracles or mysteries, etc. Narratives are most often set on earth. Can be either fiction or non-fiction. ex. *America's Most Haunted Places, Haunted History, Blair Witch Project, Omen, Exorcist, Carrie, Sixth Sense, The Others, Ghostbusters, Casper, Twilight Zone, Scooby Doo, Devil's Advocate, Dogma, Bruce Almighty, It's a Wonderful Life, Family Man*
9	**Uncodeable**	It is impossible to accurately discern the realistic nature from the information provided.

VII. *Curriculum*

Determine the nature of the curriculum that the program is intended to provide.

Some programs tend to have multiple curricular goals. In such cases, assess and code for the PRIMARY goal or focus of the program. For example, *Sesame Street* teaches lessons to enhance both children's pro-social values as well as their school readiness skills. However, the pro-social messages are embedded within lessons that teach school readiness skills, such as learning shapes and numbers. That is, the school-readiness lessons are the main focus. In this case, the appropriate label for this program is "School Readiness (=2)" [NOT "Pro-Social (=1)"].

Also note that we are assessing the 'general, overall' curricular of the program itself. That is, we are assessing only that curriculum which consistently makes up a major part of the regular formula of the program. You should NOT focus on 'irregular, occasional happenings' of one or two specific episodes or scenes.

The program must fit into one of the following six labels (0~5) or be coded as "Uncodeable (=9):

Value	Label	Definitions & Examples
0	**No Curriculum**	Does not have a salient or consistent goal to teach or to present subject matter in an informative manner. Is not designed to achieve any of the below curricular goals. Usually for general entertainment. ex. *Die Hard, Good Morning America, Real World, Monday Night Football, CSI, Law & Order, Looney Tunes, Babe,* news
1	**Pro-Social**	Primary goal is to promote appropriate and positive values, attitudes, behaviors, or inter-personal interactions (family, friendships, sharing, cooperation, tolerance of cultural diversity, don't drink and drive, safe sex). Intends to teach a moral lesson. Includes programs with religious messages. ex. *Barney and Friends, Clifford: The Big Red Dog, Mr. Rogers, Seventh Heaven, Full House, Brady Bunch, Leave it to Beaver, Dragon Tales, Cosby Show, Charlotte's Web, Stuart Little, David and Goliath,* televised church services
2	**School Readiness**	Primary goal is to enhance children's perceptual and cognitive skills and to prepare them for school. Teaches counting, basic math, and reading. Generally aimed at pre-school children. ex. *Sesame Street, Reading Rainbow, Dora the Explorer, Between the Lions*

3	**Extended Academic Learning**	Primary goal is to teach advanced skills beyond the elementary-school level. Usually intended for higher education or to supplement learning for people in middle-school or above. Teaches advanced English, non-English languages, political science, economics, psychology, etc. ex. PBS language programs, distance-learning programs

(*Curriculum* continued…)

(*Curriculum* continued)

Value	Label	Definitions & Examples
4	**Informal Learning**	Primary goal is to deliver information that may assist in developing skills for certain leisure activities, such as knitting, sewing, painting, pottery, gardening, home building/renovation, auto repair, fishing, cooking, fashion, exercise, etc. Generally presented in a format that makes it easy for the viewer to follow along. Usually classified under the *Genre* of "Do-It-Yourself/Hobbies (=3)." Usually intended for adults. ex. *Emeril Live, Trading Spaces, Martha Stewart, What Not To Wear*
5	**Culture / Science / History**	Primary goal is to inform about specific cultures; scientific facts; historical events, landmarks, or people; etc. Sometimes it does not intend to literally "teach a lesson" but can enhance knowledge obtained in school. Usually classified under the *Genre* of "Documentary (=16)." Programs can be intended for adults or children. ex. documentaries on *History* and *Discovery Channels*, *Magic School Bus, Bill Nye the Science Guy, Zoom*
9	**Uncodeable**	It is impossible to accurately discern the curriculum from the information provided.

VIII. *Violence*

Determine the type of violence that is present in the program.

Please note that coding for this category aims to capture the different 'qualities' or 'types' of violence portrayed in a program. The coding labels do NOT represent a scale of violence ranging from 'least to most' violent. In other words, we are assessing the 'qualitative' rather than the 'quantitative' aspects of violence within a program.

Also note that we are assessing the 'general, overall' tone of the program itself. That is, we are assessing only that violence which consistently makes up a major part of the regular formula of the program. You should NOT focus on 'irregular, occasional happenings' of one or two specific episodes or scenes. However, within a film, if the one violent scene is crucial to the development of the narrative and characterization or makes up the climax of the program, it should be considered.

The program must fit into one of the following seven labels (0~6) or be coded as "Uncodeable (=9):

Value	Label	Definitions & Examples
0	**Non-Violent / Non-Hostile**	Does not directly show nor indirectly imply violent/hostile behaviors, attitudes, etc. Is neutral on violence/hostility, if not friendly. ex. *Teletubbies, Seventh Heaven, Modern Marvels, Dawson's Creek, Oprah,, American Idol, Newlyweds*
1	**Slapstick / Comedic Violence**	Portrayal of harsh physical stunts, abuse, and/or fighting, but presented in silly and exaggerated manner for laughs. The comedic context decreases, or even diminishes, the essential intensity of the behavior, giving off the impression of harmlessness. ex. *Three Stooges, Tom and Jerry, Road Runner, America's Funniest Home Videos, Monty Python, National Lampoon* series*, Carol Burnett Show*
2	**Sports Violence**	Violence that is part of the very nature of a sports event. Also includes violence that occurs outside of the actual game but is due to a happening during the actual game. Injury and damage may occur most often as a result from harsh physical contact with another athlete. Includes most contact-sports programs. Sports depicted in film (ex. *Rocky*) and accidents or brawls that occasionally happen during a sports event are NOT considered under this label. ex. boxing, wrestling, rugby, football, hockey, roller derby, etc. (NOT gymnastics, ice skating, baseball, basketball, etc.)

(*Violence* continued)

Value	Label	Definitions & Examples
3	**Victimization**	Realistic portrayals of undeserved victimization of crime, such as murder, burglary, robbing, mugging, kidnapping, child abuse, etc. Includes crimes against humanity or hate crimes against specific gender, sexual orientation, race/ethnicity, etc. Main story revolves around or is motivated by such crimes; sometimes, the crime serves as the central impetus to the storyline. Invokes a "This can happen to me, too!" type alarm or fear. The actual act of crime can take place on screen (visible) or off screen (implied). Can be either fiction or non-fiction. Captures most of those coded as "Case Solving (=10)" and "News (=1)" under the *Genre* coding section. Also includes graphic injuries, deaths, and physical action due to natural disasters (storms, tornados, hurricanes, earthquakes, volcanoes, etc.) and non-fictional animals. Includes victimization of animals by humans. ex. *CSI, Law & Order, America's Most Wanted, Cold Case Files, Panic Room, Ransom, Schindler's List, The Holocaust, Mississippi Burning, As Good as It Gets, Bambi, Lion King, Sleeping Beauty, Snow White, 101 Dalmatians, ER, Cinderella, Perfect Storm, Twister, Anaconda, Jaws,* news
4	**Gratuitous Violence**	The actual, physical act of violence is visually depicted and is a prominent characteristic; involves a lot of physical action, such as fighting and killing. Includes depictions of war in action. Also includes graphic injuries, deaths, and physical action (flying bodies) due to big explosions and collisions. A character takes on a violent act as a means to an end; always has a reason, whether it is morally right or wrong. Captures many of those coded as "Action/Adventure (=11)" and "Horror/Thriller (=12)" under the *Genre* coding section. Also includes nature documentaries that depict animals killing prey and fictional dramas that depict violence inflicted on humans by fictional creatures/animals, which usually have artificial human intelligence. ex. *Die Hard, Lethal Weapon, Rambo, Scream, I Know What You Did Last Summer, Saving Private Ryan, Full Metal Jacket, Band of Brothers, Deep Blue Sea, King Kong, Godzilla, Jurassic Park,* adult Japanese-anime

5	**Ultra Violence**	Main characteristic is the repetitive, "in-your-face" presentation of violence, hostility, brutality, and the truly evil; violence that does not have any clear moral or rational aim. Usually, a violent act is not a means, but an end in itself for the character and overall narrative. Includes overt and extensive portrayals of fighting, beating, killing, rape, and torture, which are usually accompanied with graphic depiction of blood and body parts. Can be very shocking and grotesque. Applies more to movies than TV programs. ex. *Godfather, Natural Born Killers, Pulp Fiction, Reservoir Dogs, Trainspotting, Clockwork Orange, Bad Lieutenant, True Romance, The Cook the Thief His Wife & Her Lover, Seven, Hannibal*
9	**Uncodeable**	It is impossible to accurately discern the existence of violence from the information provided.

APPENDIX D.

DATA COLLECTION PROCEDURES FOR PSID CDS

As appears in 1997 CDS User's Guide (Hofferth et al., 1998)

In each household, the following steps were taken:

1. Take PSID interview.
2. If there is an eligible child, a Child Case is generated by Data Control.
3. Data Control staff print a set of labels, CAI (Computer Assisted Interviewing) Sample Management System (CSMS) checklist, and an information sheet for the household and teacher.
4. The Data Services research assistant prepares and mails the sample line packet (containing coversheets, labels and information sheets) to the interviewer assigned to the case.
5. The interviewer reviews the sample line packet and labels the appropriate questionnaires.
6. The interviewer contacts the household, verifies the primary caregiver section, explains the study, verifies the mailing address, and sets up an appointment for an in-person interview.
7. The interviewer mails an introductory packet to the household containing a study brochure, introduction letter, and time diaries.
8. The interviewer visits the household and gets written permission to interview the child(ren) from the primary caregiver. The interviewer administers the child assessments and primary caregiver (and the child, if appropriate).
9. The interviewer gives the appropriate self-administered questionnaires to the primary caregiver and the other caregiver (if one is in the household).
10. The interviewer obtains written parental permission to contact teachers and caregivers for children in school, preschool, or child care.
11. The interviewer obtains contact information for fathers living outside the home, if applicable.
12. After the interview is completed, the interviewer edits the interviews and enters complete information about the contact and the interview into CSMS.
13. The interviewer mails the school questionnaires to the appropriate teachers, caregivers, and school administrators.
14. The interviewer notifies Ann Arbor via CSMS that the teacher information has been mailed.
15. The interviewer mails an introductory letter to the father living outside the home, if applicable.
16. The interviewer contacts and interviews the father living outside the home, if applicable.
17. The interviewer edits the father outside the home questionnaires, if applicable.
18. The interviewer reports the completed household session to the Team Leader (TL).

19. The TL instructs the interviewer to mail the completed questionnaires to Ann Arbor (if no verification is required) or to the TL (for verification and evaluation).
20. The interviewer mails competed and edited interviews to Ann Arbor or the TL, as instructed.
21. The TL evaluates and verifies the interview, if applicable, gives feedback to the interviewers, primary caregivers, other caregivers, teachers, childcare providers, and administrators.
22. The Ann Arbor staff logs completed questionnaires as they are received from interviewers, primary caregivers, other caregivers, teachers, childcare providers, and administrators.
23. The Survey Sciences Lab (SSL) staff mails reminder postcards one week after the interviewer has mailed the materials to the teachers and administrators.
24. The SSL staff conducts reminder calling for nonresponding teachers, caregivers, and administrators beginning two weeks after the interviewer has mailed the materials to the teachers and administrators. A second questionnaire is mailed by the SSL staff if necessary.
25. A total of two rounds of 5 calls each will be made before coding the case as final non-response, if the questionnaires are not returned.
26. The SSL staff enters the completed time use diaries into the SAS data entry program created by the PSID staff.
27. The SSL staff enters all completed questionnaires into the SAS data entry program created by PSID staff.
28. The SSL conducts check coding on 10% of Home Time Diaries and Home-based Care Time Diaries, and performs double entry verification on questionnaires for quality control purposes.
29. Completed questionnaires are stored by PSID staff once the questionnaires are coded and processed.

APPENDIX E.

COVARIANCE MATRICES FOR PATH MODELS

Covariance Matrix for Dosage Models (n = 472)

	EdHrs	VioHrs	IndRead	PosBeh	ExtProb	IntProb	MathSE	ReadSE	Read07	Math07	ParEd	CogScale
EdHrs	9.801											
VioHrs	1.17	22.493										
IndRead	4.041	-39.155	14934.47									
PosBeh	-0.024	-0.266	1.482	0.389								
ExtProb	0.519	1.938	-30.681	-1.377	16.841							
IntProb	0.732	1.776	-4.274	-1.024	8.851	10.209						
MathSE	-0.156	0.055	0.321	0.055	-0.341	-0.413	-0.769					
ReadSE	0.183	0.282	8.796	0.047	-0.116	0.135	0.057	0.843				
Read07	7.227	-7.127	709.404	1.833	-24.138	-11.24	1.299	6/514	881.60			
Math07	4.863	-2.507	234/596	0.658	-11.000	-6.171	3.762	0.148	302.920	239.717		
ParEd	0.690	-0.067	47.270	0.108	-1.315	-0.663	0.048	0.205	31.067	15.016	8.059	
CogScale	0.802	-0.326	31.983	0.106	-0.946	-0.210	-0.080	0.134	22.979	10.660	2.438	4.368

Covariance Matrix for Diet Models (n = 472)

	TotTV	PropEd	PropV	IndRead	PosBeh	ExtProb	IntProb	MathSE	ReadSE	Read07	Math07	ParEd	CogScale
TotTV	90.781												
PropEd	-0.354	0.073											
PropV	0.088	-0.012	0.076										
IndRead	-138.32	1.882	1.558	14934.47									
PosBeh	-0.894	0.004	0.002	1.482	0.389								
ExtProb	3.927	0.009	0.040	-30.681	-1.377	16.841							
IntProb	3.309	0.010	0.058	-4.274	-1.024	8.851	10.209						
MathSE	-0.434	-0.003	0.003	0.321	0.005	-0.341	-0.413	0.769					
ReadSE	0.223	0.018	0.013	8.796	0.047	-0.116	0.135	0.057	0.843				
Read07	-49.517	1.416	0.237	709.404	1.833	-24.138	-11.240	1.299	6.514	881.69			
Math07	-26.898	0.708	0.239	234.596	0.658	-11.000	-6.171	3.762	0.148	302.92	239.717		
ParEd	-4.311	0.070	0.101	47.270	0.108	-1.315	-0.663	0.048	0.205	31.067	15.016	8.059	
CogScale	-4.008	0.109	0.064	31.983	0.106	-0.946	-0.210	-0.080	0.134	22.979	10.660	2.438	4.368

Covariance Matrix for Educational TV Hours and Applied Problems (n = 325)

	AP97	AP02	AP07	Inc97	Inc02	Inc07	EdHrs97
AP07	327.05						
AP02	152.00	268.53					
AP07	123.41	173.52	216.47				
Inc97	13.12	13.63	12.68	5.39			
Inc02	15.09	17.24	16.49	4.83	7.48		
Inc07	16.93	19.27	19.57	4.78	6.82	9.33	
EdHrs97	3.79	1.58	4.95	.05	-.40	.41	12.34

Covariance Matrix for Educational TV Hours and Letter-Word Recognition (n = 325)

	LW97	LW02	LW07	Inc97	Inc02	Inc07	EdHrs97
LW07	180.62						
LW02	89.30	239.28					
LW07	86.48	196.03	260.57				
Inc97	10.11	11.74	12.94	5.39			
Inc02	10.43	13.81	16.06	4.85	7.54		
Inc07	12.18	15.16	18.16	4.76	6.81	9.30	
EdHrs97	8.86	6.44	5.77	.02	-.42	.38	12.25

Covariance Matrix for Educational TV Diet and Applied Problems (n = 325)

	AP97	AP02	AP07	Inc97	Inc02	Inc07	TotTV97	PropEd
AP07	327.05							
AP02	152.00	268.53						
AP07	123.41	173.52	216.47					
Inc97	13.12	13.63	12.68	5.39				
Inc02	15.09	17.24	16.49	4.83	7.48			
Inc07	16.93	19.27	19.57	4.78	6.82	9.33		
TotTV97	-30.58	-41.36	-35.53	-4.74	-5.20	-5.51	98.35	
PropEd	.68	.74	.90	.04	.03	.08	-.43	.08

Covariance Matrix for Educational TV Diet and Letter-Word Recognition (n = 325)

	LW97	LW02	LW07	Inc97	Inc02	Inc07	TotTV97	PropEd
LW07	180.62							
LW02	89.30	239.28						
LW07	86.48	196.03	260.57					
Inc97	10.11	11.74	12.94	5.39				
Inc02	10.43	13.81	16.06	4.85	7.54			
Inc07	12.18	15.16	18.16	4.76	6.81	9.30		
TotTV97	-22.38	-29.84	-32.46	-4.88	-5.15	-5.51	98.93	
PropEd	.94	1.10	1.11	.03	.03	.08	-.43	.08

Covariance Matrix for Violent TV Hours and Applied Problems (n = 324)

	AP97	AP02	AP07	Inc97	Inc02	Inc07	VioHrs97
AP07	327.82						
AP02	152.14	268.91					
AP07	123.33	173.44	216.28				
Inc97	13.12	13.63	12.65	5.40			
Inc02	15.06	17.18	16.39	4.84	7.47		
Inc07	16.93	19.26	19.54	4.78	6.82	9.35	
VioHrs97	-1.68	-8.35	-3.57	-.03	-.04	-.73	24.61

Covariance Matrix for Violent TV Hours and Letter-Word Recognition (n = 324)

	LW97	LW02	LW07	Inc97	Inc02	Inc07	VioHrs97
LW07	180.95						
LW02	89.68	239.36					
LW07	85.93	196.42	262.85				
Inc97	10.27	12.02	13.07	5.40			
Inc02	10.34	14.03	16.07	4.84	7.47		
Inc07	12.25	15.41	18.25	4.78	6.82	9.35	
VioHrs97	-3.77	-2.26	-7.87	-.03	-.04	-.73	24.61

Covariance Matrix for Violent TV Diet and Applied Problems (n = 324)

	AP97	AP02	AP07	Inc97	Inc02	Inc07	TotTV97	PropVio
AP07	327.82							
AP02	152.14	268.91						
AP07	123.33	173.44	216.28					
Inc97	13.12	13.63	12.65	5.40				
Inc02	15.06	17.18	16.39	4.84	7.47			
Inc07	16.93	19.26	19.54	4.78	6.82	9.35		
TotTV97	-30.69	-41.50	-35.66	-4.75	-5.20	-5.53	98.35	
PropVio	.22	-.13	.26	.07	.08	.07	-.02	.08

Covariance Matrix for Violent TV Diet and Letter-Word Recognition (n = 324)

	LW97	LW02	LW07	Inc97	Inc02	Inc07	TotTV97	PropVio
LW07	180.95							
LW02	89.68	242.36						
LW07	85.93	198.42	262.85					
Inc97	10.27	12.02	13.07	5.40				
Inc02	10.34	14.03	16.07	4.84	7.47			
Inc07	12.25	15.41	18.25	4.78	6.82	9.35		
TotTV97	-24.08	-31.11	-33.47	-4.75	-5.22	-5.53	98.65	
PropVio	-.13	.12	-.03	.07	.08	.07	-.02	.08

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